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ANATOMICAL DIALOGUES:

OR, A

BREVIARY OF ANATOMY:

WHEREIN

ALL THE PARTS OF THE HUMAN BODY

ARE

CONCISELY AND ACCURATELY DESCRIBED,

AND

THEIR USES EXPLAINED;

BY WHICH

THE YOUNG PRACTITIONER

MAY ATTAIN A RIGHT METHOD OF

TREATING DISEASES,

AS FAR AS IT DEPENDS ON ANATOMY.

CHIEFLY COMPILED

FOR THE USE OF THE YOUNG GENTLEMEN

IN

THE NAVY AND ARMY.

BY A GENTLEMAN OF THE FACULTY.

THE FOURTH EDITION,

WITH ADDITIONS AND AMENDMENTS.

L O N D O N:

PRINTED FOR G. G. AND J. ROBINSON, NO. 25,
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TO WILLIAM HUNTER, M.D.
PHYSICIAN TO HER MAJESTY,

FELLOW OF THE ROYAL COLLEGES
OF PHYSICIANS IN LONDON AND EDINBURGH,

OF

THE ROYAL SOCIETY,

AND OF

THE SOCIETY OF ANTIQUARIANS,

THE FOLLOWING

ANATOMICAL DIALOGUES

ARE,

WITH THE HIGHEST ADMIRATION OF HIS
ABILITIES,

AND WITH THE GREATEST RESPECT
FOR HIS VIRTUES,

MOST HUMBLY INSCRIBED

BY HIS MOST OBEДИENT

AND OBLIGED PUPIL,

THE EDITOR.

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P R E F A C E.

AS the Public will undoubtedly expect some Reason to be given for intruding on them another Work of this Kind, when so many learned and judicious Authors have professedly written on the Subject, I think it necessary to inform them, That it is neither from Vanity nor Prospect of Gain, that the following Sheets were compiled, but merely to render the Study of Anatomy more agreeable, and to be obtained at a less Price than any System of Anatomy yet extant. Was Ambition the Motive, I should not conceal my Name; and was Profit the Inducement, I should then have made it more voluminous and systematical: However, I hope I have omitted no essential Part of the Science necessary to be known by the young Practitioner, in order to attain a right Method of treating Diseases, as far as it depends on Anatomy; but how I have succeeded, I must leave to the impartial and judicious Reader to determine.

This Book was compiled with a view to facilitate the Knowledge of Anatomy to such young Gentlemen as are intended for the Service

vice of the Army and Navy, as well as domestic Practice.

A Compendium, containing all the Discoveries of the modern Anatomists, it is presumed has long been wanted, as a Pocket Companion for the young Student, previous to his Examination at Surgeons Hall, in which he may see, at one View, a concise Description of the Parts which compose the human Body, without distracting his Memory by the Perusal of a Number of Books, which often contain physiological Explanations very contradictory to each other.

I have thrown the whole into the Form of Dialogue, which I flatter myself will not only be more pleasing to the younger Part of the Profession, (for whom this Work is principally designed) but make a greater Impression on their Memory—Instruction being most impressive when least incumbered.

Should this Compendium be censured or condemned, by the self-sufficient and ill-natured Part of the Faculty, I doubt not but those of Learning and Liberality of Sentiment, who are an Honour to the Profession, will overlook with Candour any trifling Defects which may be found in it. Though this Performance is not by any means intended for the Use of the elder and more experienced Artists; yet even to them, it may supply the Place of a Remembrancer, of what they were before more fully informed.

informed. I am not so vain as to think it will improve their Knowledge, since nothing new can reasonably be expected in a Work of this Kind, which is chiefly collected from other Authors: But if it answers the End designed, of assisting the young Student, I shall not think my Labour and Attention in compiling it, though it has cost me much Trouble, ill bestowed.

To render the Book more useful, I have added a copious Index, by which the Reader may readily advert to any particular Subject he may want to be informed of.

London, July 1778.

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ANATOMICAL DIALOGUES.

DIALOGUE I.

OF ANATOMY IN GENERAL.

Q. WHAT is Anatomy?

A. Anatomy is the accurate dissection, or the cutting to peices of a human body, in order to discover its structure and uses: in which every physician and surgeon ought to be well skilled, exactly to know, and fully to understand every part of its proper use.

Q. What is the use of anatomy?

A. It gives you the perfect knowledge of the cause and cure of diseases; without which, neither the physician nor the surgeon can do justice in their professions, but would rather be detrimental, than beneficial to mankind.

Q. How is the body distinguished by anatomists?

A. Into venters and limbs. The venters are the most remarkable cavities of the body, in
B which

which some principal part or bowel is contained, viz. the belly, breast and head: the limbs are, the arms and legs; the cavity of the breast is called the thorax, and that of the belly, abdomen; their sub-contained parts are named as follows, viz. the hollow on the middle of the thorax, under the breasts is called *scrobiculus cordis*; the middle of the abdomen, for about three fingers breadth above and below the navel, is called *regio umbilicalis*; the middle part above this, *epigastrium*; under the cartilages of the lower ribs, *hypochondrium*; and from below the *regio umbilicalis* to the *ossa ilia* and *ossa pubis*, *hypogastrium*.

Q. What are the external parts, and common integuments?

A. These are, the cuticula, epidermis, or scarf-skin; the corpus reticulare, vel reticulum mucosum; the cutis, or true skin; the glandulæ sebaceæ, vel miliares; the membrana adiposa; and the pinguedo, or fat.

Q. What is the cuticula, epidermis, or scarf-skin?

A. It is a very fine, thin, transparent, smooth, insensible membrane, closely lying upon the cutis, or true skin, of which it seems a part, and is, with the reticulum mucosum, what rises into a bladder in burns, or when a blister is applied; it not only covers the skin externally, but lines many of the larger passages, as the alimentary canal, the lungs, vagina, urethra, &c. the colour of it in Europeans is white, but black in many other nations: having no blood-vessels or nerves, it is void of sensation.

Q. What

Q. What is the use of the cuticle?

A. To defend the true skin from injury, dryness, and pain; and to assist, and, at the same time, to moderate the sense of feeling. This membrane appears scaly and porous (through a good microscope); and Lewenhoeck and others say, every scale has about 500 pores; so that a grain of sand (according to this account) will cover 125,000 pores through which we perspire. Some say that the cuticle is not porous; others, with more probability say, that its pores are as numerous as those of the skin, but that they are too small to be discovered, except by the help of good microscopes.

Q. What is the corpus reticulare, vel reticulum mucosum?

A. A substance, which hath been thought to represent a net-work; hence its name. It lies immediately under the cuticle, to which it firmly adheres; it is of a soft mucilaginous, viscid nature, and fills up the interstices of the fibres running between the cutis vera, and cuticula. After raising the cuticle in a negro, this substance appears of a black colour, and is compounded of two layers: from its colour, and the colour of the mucus it contains, the skin appears to be either black or white: in Europeans, white; in Africans, black; in the tawny, yellowish.

Q. What are the uses of the corpus reticulare?

A. To preserve the structure of the other parts of the integuments, to give passage to the hairs, papillæ, and excretory ducts, and retain them in their places; and it has some share in

preserving the softness of the papillæ, which renders them fit for the sense of feeling.

Q. What is the cutis, or true skin?

A. The true skin is a very compact, thick, strong, and sensible membrane, covering the whole body, and so plentifully supplied with nerves for the sense of touching, that the very finest pointed instrument can prick no where, without touching some of them. Immediately above this membrane, is the corpus reticulare and cuticula; and under it, the membrana adiposa and fat. Its thickness is very different in several parts of the body. It is composed of a multitude of tendinous fibres, a vast number of blood-vessels and nerves, which constitute the pyramidal papillæ that raise themselves through the pores of the corpus reticulare, and constitute the organs of feeling. The true skin is white in all mankind. Its appearing white, black, or tawny (according to the climate) is owing to the colour of the cuticula and corpus reticulare, and not to the colour of the skin, which is always white in all nations. The red colour of the lips is owing to the blood-vessels in the muscular flesh; and that of the cheeks in white people, to the blood in the minute-vessels of the skin.

Q. What are the uses of the skin?

A. To defend the parts underneath from external accidents, to be the organ of feeling, to wrap the parts more firmly together, and to be an universal emunctory to the body, cleansing the blood of its redundances by sweat and perspiration,

ration, which at the same time, prevents its flaccidity or dryness.

Q. What are the *glandulæ sebaceæ*?

A. The *glandulæ sebaceæ*, vel *miliares*, are small bodies like millet-seeds, seated immediately under the skin in the axillas; and are said to have been found under all other parts of the skin when looked for with good microscopes.

Q. What are the uses of the *glandulæ sebaceæ*, vel *miliares*.

A. These glands are supposed to separate sweat; which fluid was thought to be only the *materia perspirabilis*, flowing in a greater quantity, and condensed, till Sanctorius assured us that it is not so; and that more of the *materia perspirabilis* is separated in equal times, than of sweat: of the former he says, there are usually fifty-two ounces a day separated (in Italy, where his experiments were made), but of the latter, not near so much in the most profuse sweats. But whoever reads Mr. Hales's experiments, will find what Sanctorius accounted for by an imaginary, insensible perspiration, different from that which in the greatest degree produces sweat, is really made by the lungs in respiration, in ten times a greater quantity than all the ordinary perspiration through the cutis, and seems to be but the same kind of fluid discharged both ways; for whenever it is interrupted thro' the skin in cold weather, then the lungs are overcharged, and a cough is produced.

Q. What is the *membrana adiposa*?

A. All that membrane immediately under the skin, containing the fat in numerous cells, by

some named cellulæ, and the substance made up of them, termed the cellular substance; this membrane adheres very closely to the skin, and runs between the muscles in general, and between their several fibres in particular; and communicates with the membrane which lines the inside of the thorax and abdomen; and all its cells communicate throughout the whole body, so that from any one part the whole may be filled with air, as is evident in beasts, by the butcher's blowing up their meat when newly killed; and in an emphysema of the human body sometimes occasioned by a broken rib, &c. And in these cells the water is contained in an anasarca, which, from its weight first fills the depending parts; and when these cells are very full, the water frequently passes from them into the abdomen; and after tapping, though the limbs were ever so full, they will almost empty themselves in one night's time. This membrane is also the usual seat of imposthumations, carbuncles, and boils.

Q. What are the uses of the membrana adiposa?

A. It contributes to keep the inner parts warm and pliant; and by filling the interstices of the muscles, renders the surface of the body smooth.

Q. What is the pinguedo, or fat.

A. It is an oleaginous or butyraceous matter, secreted from the blood (in the little arteries of the adipose membrane) and filling up the cavity of the cells of the membrana adiposa; and that this oleaginous matter has a circulatory

latory motion, or an egress into the veins, is very evident from the sudden consumption of it in many diseases, and from its vast diminution by exercise and labour.

Q. What are the uses of the fat?

A. To serve as a kind of covering to the body in order to defend it from cold, and other injuries; to defend the more tender and sensible parts from being too strongly vellicated by the salts; to preserve in good order, the flexion of the muscles and cutis, and of the other parts between, and about which it is placed; to facilitate the motions of some parts, as the eyes, jaws, &c. to fill up the interstitial spaces, and by that means to add to the beauty of the parts, as is evident in the face, neck, &c. and to facilitate the distension of the parts, the spaces between which it thus fills up. There is a manifest use of the fat about the vagina, anus, ossa ischia, and pudenda, in the exclusion of the fœtus, and the harder excrements, and in the soles of the feet, the nates, and other the like parts, in all which the fat is very copiously disposed, and serves in the place of a cushion for the muscular flesh to rest on, and to prevent the painful pressure and attrition of the parts; and finally, there is great reason to suppose, that when the body does not receive nourishment in the usual way, the regress of the fat into the veins supplies that defect.

Q. What are the constituent parts of the body?

A. The body consists of bones, cartilages, ligaments, muscles, tendons, arteries, veins,

B 4

nerves,

nerves, lymphæducts, glands, excretory vessels, membranes, fibres, hair and nails, besides the integuments before mentioned.

Q. What are the bones?

A. The bones are hard, brittle, insensible, parts, but covered both on their inside and outside with an exquisitely sensible nervous vascular membrane, called pariossteum, (except on the skull, where it is called pericranium) containing more or less marrow; and on the surface of the bones, at the ends, are two kinds of prominences; the one termed apophysis, or processus, and the other epiphysis, or appendage. Besides the common large cavity, most bones have superficial cavities or sinuses, with furrows and holes through which the nutritious and medullary vessels enter (as all the membranes of the bones, both within and without, are supplied with blood vessels and nerves, as is the marrow.) The most considerable of the nutritious vessels enter at the end of the bones, viz. the artery at one end, and the veins at the other. If the bones had no cavities, they would, if they were strait, sustain the same weight; but being made hollow, their strength to resist breaking transversely is increased in proportion to their diameters, without increasing their weight, which is very evident in the wings and quills of birds: but the bones in the legs of all animals are more solid, being formed to support weight.

The bones, like all other parts where large vessels do not enter, are generally of a white colour; only in a living creature they are bluish, which is owing to the blood in the small vessels
under

under their surface. The less therefore and fewer the vessels are, and the thicker and firmer the boney surface covering the vessels is, the bones are whiter; hence the bones of adults are whiter than those of children; and, in both young and old, the white colour of different bones, or of the several parts of the same bone, is always in proportion to their vessels and solidities; which circumstance ought to be regarded by surgeons, when they are to judge of the condition of bones laid bare.

Q. What is the apophysis of a bone, and its use?

A. The apophysis is a continued part, or excrescence of the bone (as a branch is of a tree) jutting out from it, to make the better articulations, and for the more commodious insertion of the muscles.

Q. What is the epiphysis of a bone and its use?

A. The epiphysis is an additional bone growing to another by mere contiguity, being generally more soft and porous than the other, though it mostly degenerates into an apophysis in adults, and therefore of the same use.

Q. What is the medulla, or marrow; contained in the bones?

A. It consists (besides the blood-vessels) of an investing membrane, in which are included membranaceous lobules and bags that fill up the cells of the bones; and in these bags are vesiculæ, or glandulous bladders, very like the vesicular substance of the lungs. The large middle cavity of all cylindrical bones, contains an oily marrow; but the great number of lesser cells,

2

towards

towards their extremities, contain a bloody marrow, or rather a kind of red, fatty, medullary, juice; which last is found in all spongy heads and cells of bones. The marrow in young bones is more red and bloody than in old ones, as the oily marrow would otherwise render their fibres too soft. The medullary vessels, found running here and there, through their proper canals, penetrate into the inner cavity of the bones and secrete the medullary part from the blood, the blood being afterwards returned by the veins; the nerves are distributed to the same places, for the sake of sense and motion; these vessels enter the bones obliquely, that they may not weaken them by dividing too many fibres in the same place.

Q. What is the use of the marrow?

A. The marrow being more or less distributed all over the bones, and transfusing through their plates and fibres, makes them tougher and less brittle; but does not nourish them, as was originally believed.

Q. What is the periosteum?

A. An exquisite sensible, nervous, vascular membrane, which lines and covers all the bones in the body, internally and externally, except a part of the teeth, and the places in bones where the muscles are inserted. The periosteum on the outside of the bones, is derived from the membranes of the muscles that lie upon it; that on the inside, from the dura mater. The inner superficies of the periosteum stick as close to the bone as if it were glued to it; and besides, the periosteum has little fibrillæ or threads continued from it, that enter into the substance of the bone,

bone, which give them, probably, some internal sense. The periosteum constitutes the first rudiments of the bones in a fœtus in utero. It is every where full of small blood vessels, which enter the bones for their nourishment; but the internal substance of the larger bones is nourished by the vessels which enter obliquely through their middles. The periosteum is of different thickness in different parts; but, in general, the internal is vastly thinner than the external; and though some have supposed it to arise from the dura mater, yet it is evidently formed, at the same time, with the dura mater in the fœtus.

Q. What are the uses of the periosteum?

A. It gives sensibility to the bones, which otherwise might be sawed, cut, or burnt, without pain; as their whole sensibility is owing to this membrane: and it also gives the determination and figure to bones; as is evident from this that when it is wounded, exostoses, topi, and caries, arise in the part: it is likewise the organ of secretion for the bony matter, as the membrana adiposa is for the fat: and it serves also for the muscles to slide easy upon, and to hinder them from being lacerated by the roughness and hardness of the bones.

Q. What is the substance of the bones?

A. The substance of the bones consists of lamellæ or plates, lying one upon the other, joined together by transverse fibres, and, as it were, archwise: these fibres, when first formed, are very soft, but grow by degrees to the hardness of a cartilage, and afterwards to that of a perfect bone. But the change is neither made in a
very

very short time, nor begun in all the parts of the same bone at once.

Q. What are the uses of the bones?

A. They give strength and shape to the whole body, sustain all its organs, and keep the machine in proper order to perform its various functions; therefore the exact knowledge of the bones is the foundation of all anatomy. The bones are connected together various ways according to the various purposes they are to serve; some being intended for motion, others for rest, and the support of the incumbent parts only.

Q. How many bones are there in the human body?

A. Two hundred and forty-seven (exclusive of the sesamoidal bones, whose number is uncertain); but the number is various in various subjects; some say 300, or 307; others, 318, but late writers fix it at most to 250, and commonly but 247, as follows.

A TABLE

A TABLE OF OSTEOLOGY.

| | | | | |
|---------------------------|--|---|---------------------|----|
| The bones of the head are | The bones of the cranium, or Skull | { | Os Parietalia | 2 |
| | | | Æthmoides | 1 |
| | | | Frontis | 1 |
| | | | Occipitis | 1 |
| | | | Sphenoides | 1 |
| | The bones of the fauces and face | { | Temporum | 2 |
| | | | Os Malarum | 2 |
| | | | Maxillaria | 2 |
| | | | Nasi | 2 |
| | | | Plana | 2 |
| | | | Palati | 2 |
| | | | Vomer | 1 |
| | The bone of the lower jaw | { | Ungues | 2 |
| | | | Os Maxilla Inferior | 1 |
| | Dentes the teeth | { | Dent Canini | 4 |
| | | | Incisores | 8 |
| | | | Molares | 20 |
| | The bone of the os hyoides of the tongue | { | Os Hyoides | 5 |
| | | | Os Incus | 2 |
| | The bones of the internal ear | { | Malleus | 2 |
| | | | Orbiculare | 2 |
| | | | Stapes | 2 |

No. 67

| | | | | | | |
|----------------------------|------------|---|----------------------|---|-----------|----|
| The bones of the trunk are | The spine | { | Vertebræ | { | Neck | 7 |
| | | | | | Back | 12 |
| | | | | | Loins | 5 |
| | The thorax | { | Os Sacrum and Coccyx | { | | 2 |
| | | | | | | 3 |
| | | | | | | 24 |
| | | | | | | |
| | The pubes | { | Ossa Inominata | { | Os Illium | 1 |
| | | | | | Ifchium | 1 |
| | | | | | Pubis | 1 |

TABLE Continued.

| | | | No. |
|-------------------------------------|--------------|---------------|-----|
| The bones of the upper extremities. | The shoulder | { Clavicula | 2 |
| | | { Scapula | 2 |
| | The arm | Os Humeri | 2 |
| | The fore-arm | { Ulna | 2 |
| | | { Radius | 2 |
| | | Os Naviculare | 2 |
| | | { Lunare | 2 |
| | | { Cuneiforme | 2 |
| | | { Magnum | 2 |
| | | { Orbiculare | 2 |
| | | { Trapezium | 2 |
| | | { Trapezoides | 2 |
| | | { Unciforme | 2 |
| The hand | { | Metacarpus | 8 |
| | | Phalanges | 30 |
| | | | |

| | | | |
|-------------------------------------|-----------|--------------|------------|
| The bones of the lower extremities. | The thigh | — Os Femoris | 2 |
| | | { Os Patella | 2 |
| | The leg | { Tibia | 2 |
| | | { Fibula | 2 |
| | | Os Calcis | 2 |
| | | Astragalus | 2 |
| | | Cuboides | 2 |
| | | Cuneiformia | 6 |
| | | Naviculare | 2 |
| | The foot | Metatarsus | 10 |
| | | Phalanges | 28 |
| | | | <hr/> |
| | | | In all 247 |

Q. What are the cartilages?

A. Cartilages approach much to the nature of bones, but are smooth, lubricous, flexible, and elastic. There is no sensible cavity, cell, or pore, in any part of the substance of those which cover the ends of bones, except very small passages for the blood vessels, &c. They are whitish, or pearl coloured; and with age, sometimes grow so hard, as to become perfect bone. Though they have no fibrous appearance, but have a smooth surface, not only externally, but when cut through; yet by steeping them, unravelling and examining with a microscope, fibres are plainly discovered.

Q. What are the uses of the cartilages?

A. Their use is to cover the ends of the bones that have motion to prevent them from being damaged by a continual friction; and to contribute, in a great measure, to the formation of several parts, as the larynx, nose, ears, &c.

Q. What are ligaments?

A. Ligaments are white, fibrous, close, compact substances, more flexible than cartilages, not easily ruptured or torn, and do not yield, or at least but very little, when pulled. They form either narrow cords, broad bands, or thin webs. In all the moveable joints there are capsular ligaments; so called, from a very fluid, mucilaginous liquor (termed synovia) being contained in capsulæ, or bags; which liquor continually moistens the articulations. It is generally agreed, that the ligaments are nearly insensible in their natural state; but experience shows, that they are capable of very acute pains when

when diseased, nothing being more painful than collections of matter within these parts, or sharp medicines applied to them when laid bare.

Q. What are the uses of the ligaments?

A. Their use is either to bind down the tendons, or to tie together such bones as have motion, to prevent them from parting from each other, as happens in luxations.

Q. What are muscles?

A. Muscles are distinct portions of flesh, soft and red; compounded of fibres, tendons, nerves, veins, and arteries, all enclosed in a peculiar membrane; every muscle has one or more tendons at its beginning and end, though sometimes so very small, as not to be seen without a microscope. Where the nerve is inserted, is the head or beginning of the muscle; the middle, or fleshy part, is its belly; and where the tendons are greatest, and most in number, is called the tail or end; and if the end be broad and membranous, it is called aponeurosis; but in many of the muscles both the extremities are moveable; in those, that part which of the two is least moveable, is generally called the origin, or head; though in the *serati antici*, and some of the muscles of the abdomen, it is the reverse. All the muscles are either rectilinear or penniform, and formed for flexion or extension, and sometimes both. To every flexor is opposed an extensor; to every adductor, an abductor; to every elevator, a depressor, except only in the sphincters, cremasters and œsophagus. Some muscles are mostly carnosus, as all the sphincters and muscles of the tongue; others,

others, mostly nervous and membranous, as the fascia lata tibia adducens, quadratus vel distortor oris; by Galen named platysma myoides, being first contracted involuntarily in the spasmus cynicus.

Q. What are the uses of the muscles?

A. To promote voluntary motion, as by the contraction of the muscles the several motions of the body are performed. Thus, the soul effects motion in the muscle at pleasure, by transmitting from the brain by the nerves, animal spirits, by whose copious influx the muscles to be moved are in an instant inflated, and so contracted, that they pull and move the member to which the tail is fastened: to this end, nature hath inserted a nerve or more into each muscle; so that flesh and nerves are the principal constituents of a muscle; and indeed, some muscles seem to have their bodies made up of nothing else than an intermixture of nervous and fleshy fibres; as the muscles of the forehead, temples, bladder, anus, and all sphincters. The motions of the far greater part of the muscles are voluntary, or dependent on our will; those of a few others involuntary: those which perform the voluntary motions, receive nerves from the brain or spinal marrow; those which perform their motions involuntarily, have their nerves from the cerebellum; and those whose motion is partly voluntary, and partly involuntary, have theirs in part from the brain, and in part from the cerebellum. And as a muscle can no longer act when its nerve is either cut asunder, or tied up, so nearly the same absolute de-

pendence it has on its artery; for on cutting, or tying up the artery, the muscle in the same manner, some hours after, loses its whole power of action, as if the nerve had been cut or tied up.

Q. What are tendons?

A. The larger muscles, particularly in the extremities, have substances joined either to one or both ends of them, which substances are called tendon; which is less than the muscle itself. The tendon is whitish, firm, hard, and tougher than the muscle, and is inelastic, for by pulling it breaks. They are formed of fibres, connected by a small quantity of cellular membrane. The fibres run parallel with each other. The tendon is not red, from having fewer vessels than the other part of the muscle to which it belongs, as in the white of the eye; but like that it becomes red either by injection or inflammation. Dr. Hunter thinks that the fibres of a tendon are not continued into the muscle; and that the tendons are only as chords fixed to the ends of muscles, which are the agents; for no one imputes any action to the tendons.

When the fibres of a tendon expand themselves into a membrane, it is called aponeurosis.

Q. What are the uses of tendons?

A. The same as that of muscles.

Q. Why are tendons used?

A. The easiness of motion in the joints required them, and they are chiefly there. If the fleshy mass of the muscle was continued down to the joint, it would be unfit for many purposes and uses that we cannot dispense with.

Suppose

Suppose, instead of tendons there were boney slender processes from the bone to be removed, to the fleshy part of the muscle, there would two inconveniences follow, which the tendons are not subject to, viz. if boney processes were used, they would be very liable to be broken by a little violence; on account of their slenderness; and laying so superficially; and secondly, they would not admit of so much motion in the joint.

Q. What are arteries?

A. Arteries are conical tubes, which arise from the ventricles of the heart; and thence dividing into branches, are distributed to all parts of the body. They are composed of three membranes, or coats. The external and internal are membranous, but the middle coat is rather muscular; consisting of circular or spiral fibres, which being very elastic, contract themselves with some force, when the power ceases by which they have been stretched out. They have two reciprocal motions, or pulsations, like the pulses of the heart; being a systole and a diastole, keeping opposite times; the systole of the one, answering to the diastole of the other.

Q. What is the use of the arteries?

A. To convey the blood from the heart to all parts of the body.

Q. What are the principal arteries of the human body?

A. The aorta vel arteria magna, and the arteria pulmonalis: all the other arteries of the body, though distinguished by particular names, are only branches of these two.

Q. What is the aorta, and how distributed?

A. The aorta vel arteria magna is a large artery which comes out from the left ventricle of the heart in a single trunk, above its valves, called *femilunares vel sigmoides*; from this all the other arteries proceed, and by which the whole mass of blood is conveyed to all parts of the body. The aorta is by anatomists generally divided into the aorta ascendens and aorta descendens, though both are but one and the same trunk. It is termed ascendens, from where it leaves the heart to the extremity of the great curvature, or arch. The descendens is that part of the trunk which, after the arch-like inflection descends through the thorax and abdomen, down to the os sacrum; and is usually larger in women than in men.

Q. How is the aorta ascendens distributed?

A. The aorta, before it perforates the pericardium, affords to the heart itself the arteriæ coronariæ; and then passing the pericardium, it is termed aorta ascendens; when, after ascending two or three inches upwards, its trunk is bent in manner of an arch, from which arises three ascending branches that form the carotid and subclavian arteries. The right carotid and subclavian proceed first in one trunk, but the left carotid and subclavian immediately single; the left carotid forming the middle branch. From the two subclavian branches (while yet within the breast) near the uppermost rib, proceeds, 1. arteria intercostalis superior, proper to the four upper ribs; 2. arteria mammaria, proper to the breasts; 3. cervicalis, proper

per to the muscles of the neck and head, and by communication, partly to the brain; 4. carotis, the external, proper to the larynx, tongue, neck, head, and brain; the internal chiefly to the brain. When the subclavian branches have left the cavity of the thorax, they are termed axillares, which are distributed to the outer parts of the breast and arms by thoracica superior and inferior; 5. scapularis; 6. humeralis; then they approach the arm, where they lie under the branches of the axillary vein, and pass to all parts of the arm, bearing the same names with the veins that accompany them.

Q. How is the aorta descendens distributed?

A. The aorta being reflected under the left lobe of the lungs, it commences aorta descendens; which name it keeps through the thorax and abdomen, where it passes on the left side of the spine, till its division into iliac arteries, between the third and fourth vertebræ of the loins. This descendent trunk, which is the greatest, being yet within the capacity of the thorax, sends, 1. intercostalis inferior, to the eight lower ribs; 2. bronchiales, to the lungs; 3. phrenicæ, to the diaphragm; 4. cæliaca, whose branches are bestowed upon the liver, pancreas, spleen, stomach, omentum, and duodenum; which are named from the parts they are bestowed on, except two upon the stomach, which are called coronaria ventriculi, superior et inferior; and one upon the duodenum, named intestinalis; 5. mesenterica superior, whose branches are bestowed upon all the intestinum

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jejunum,

jenunum, and ileum, part of the colon, and sometimes one branch upon the liver; 6. emulgentes, to the kidneys; 7. spermaticæ, to the peritonæum, ureters, testicles, and epidydimes; 8. lumbares, to the loins; 9. mesenterica inferior, to the lower part of the colon, and the rectum; 10. muscula superior, to the muscles of the belly. As soon as the aorta divides upon the loins, it sends off an artery into the pelvis, upon the os sacrum, called arteria sacra; and the branches the aorta divides into, are called iliacæ, which, in about two inches space, divide into external and internal. The iliacæ internæ, send, 1. arteria inferior, to the muscles; 2. umbilicalis, which are collapsed in adult bodies, except at their beginnings, which are kept open for the collateral branches on each side, one to the bladder, and one to the penis or uterus; 3. hypogastrica; the rest of the branches of the internal iliac are bestowed upon the buttocks, and upper parts of the thighs. The iliacæ externæ run over the ossa pubis into the thighs, sending off, 1. epigastricæ, to the fore-part of the integuments of the abdomen under the recti muscles into the pelvis, and also through the foramina of the ossa innominata, to the muscles of those parts; 2. inguinalis, to parts of the groin; 3. cruralis, to the thigh; 4. poplitea, to the ham; 5. tibialis antica et postica, which supply the leg, foot, and toes. Thus you have a description of all the large and small capital branches of the aorta, which are for the most part disposed in pairs, and are uniform in most bodies; but the lesser branches are distributed,

buted, like the branches of trees, in so different a manner in one body from another, that it is highly probable no two bodies are exactly alike, nor the two sides in any one body.

Q. How is the arteria pulmonaris distributed?

A. Only through the lungs, but with a vast number of ramifications. It arises from the right ventricle of the heart, and soon divides into two branches, one to each lobe of the lungs, then they are subdivided into smaller and smaller branches, until they are distributed through every part of the lungs. The extreme branches, both of the arteries and veins, have very numerous communications, like those in the stamina of the leaves of plants; by which communications, the blood that is obstructed in any particular vessel, may pass off by other vessels that are not obstructed, &c. and as many of the lesser vessels are more exposed to pressure than any of the large ones, those communications in the lesser vessels are therefore made more numerous. By such communications the blood circulates in a limb that has had part amputated, and the fluids contained in a large inflammation, suppurates into one cavity. It is computed, that each ventricle of the heart holds five ounces of blood (and they are filled and emptied every systole and diastole) and that there are commonly eighty pulses in a minute; if so, there then flows twenty-five pounds of blood through each ventricle of the heart in a minute. Dr. Keil has shewn, that the sum of all the fluids in a man

exceed the sum of all the solids; and yet the quantity of blood which all the visible arteries of a man will contain, is less than four pounds; and if we may suppose all the visible veins, including the vena portæ, hold four times as much, the whole, then, that the visible vessels contain, is not twenty pounds; but the whole that they do contain, is little more than the veins can contain, seeing the arteries are always found almost empty in dead bodies. How much the invisible arteries and veins contain, however (I mean those which contain such a compound fluid as is found in the larger vessels) there is no way to judge, unless we knew what proportion these vessels bear to those that carry the nutritious juices and serum (if there are such) without the globuli of the blood. It is probable, that in all animals the velocity of the blood, as well as the necessity of food, is, *cæteris paribus*, in proportion to their quantity of action: if so, it appears how those animals which use no exercise, and whose blood moves extremely slow in the winter, can subsist without any fresh supply of food; while others that use a little more exercise require a little more food; and those who use equal exercise winter and summer, require equal quantities of food at all times; the end of eating and drinking being to repair, what exercise and the motion of the blood have destroyed, or made useless: and is not the less velocity of the blood in some animals than in others, the reason why wounds and bruises in those animals do not so soon destroy life, as they do in animals whose blood moves swifter.

Q. What occasions the pulse?

A. When

A. When the left ventricle of the heart contracts, and throws its blood into the aorta, or great artery, the blood in the artery is not only thrust forward towards the extremities, but the channel of the artery is likewise dilated; because fluids, when they are pressed, press again to all sides, and their pressure is always perpendicular to the side of the containing vessels: but the coats of the artery by any small impetus may be distended; therefore upon the contraction of the heart, the blood from the left ventricle will not only press the blood in the artery forwards, but both together will distend the sides of the artery. When the impetus of the blood against the sides of the artery ceases, that is when the left ventricle ceases to contract, the spiral fibres of the artery, by their natural elasticity, return again to their former state, and contract the channel of the artery till it is again dilated by the systole of the heart. This diastole of the artery is its pulse, and the time the spiral fibres are returning to their natural state, is the distance between two pulses. The pulse is in all the arteries of the body nearly at the same time; for whilst the blood is thrust out of the heart into the artery, the artery being full the blood must move in all the arteries about the same time; and because the arteries are conical, and the blood moves from the basis of the cone to the apex, therefore the blood must strike against the sides of the vessels, and consequently every part of the artery must be dilated at or about the same time that the blood is thrown out of the left ventricle of the heart; and as soon

soon as the elasticity of the spiral fibres can overcome the impetus of the blood, the arteries are again contracted. Thus these are two causes, which operate alternately, and keep the blood in a continual motion, viz. the heart, and fibres of the arteries; but because the one is stronger than the other, therefore, though the blood runs continually, yet when the artery is opened, it is seen to move per saltum. The principle of life stimulates the heart to contract, thus the blood is propelled into the aorta; the same principle of life is continued in its influence through the arteries, stimulating their muscular fibres to action; thus the circulation is continued, and the pulse is duly maintained.

Q. What are veins?

A. Veins are tubes or vessels which carry the blood from all parts of the body to the heart. They are composed principally of a membranous, a vascular, and a muscular tunic, the same with those of the arteries, only the muscular coat is much thinner; as thin in all the veins as it is in the capillary arteries; the pressure of the blood against the sides of the veins being less than that against the sides of the arteries. The veins are only a continuation of the extreme capillary arteries, reflected back again towards the heart, which, uniting their channels as they approach it, at last form three large primary veins, viz. the vena cava, vena portæ, and the vena pulmonaris. In the veins there is no pulse, because the blood is thrown into them with a continued stream, and because it moves from a narrow channel to a wider. The capillary

lary veins unite with one another, as I have said of the capillary arteries. The veins accompany the arteries in almost every part of the body and have the same names in the several parts with the arteries which they accompany. The veins of the limbs are more than double the number of the arteries, there being one on each side each artery, even to the smallest branches that we can trace, besides the veins which lie immediately under the skin. The external veins have frequent communications with the internal, and are always fullest when we use the most exercise; because the blood being expanded by the heat which exercise produces, it requires the vessels to be distended; and the inner vessels being compressed by the actions of the muscles, they cannot dilate enough; but these vessels being seated on the outsides of the muscles, are capable of being much dilated. In all the veins which are perpendicular to the horizon, excepting those of the uterus, and the vena portæ, there are small membranes or valves; sometimes there is only one, sometimes there are two, and sometimes three, placed together, like so many half thimbles stuck to the sides of the veins, with their mouths towards the heart. In the motion of the blood towards the heart, they are pressed closely to the sides of the veins; but if the blood should fall back, it must repel the valves, so that no blood can repass them, or return towards the extreme parts from whence it came. The blood distributed to all parts of the body by the two arteries, the aorta and pulmonary, is returned by the three veins called vena cava,

cava, vena portæ, and pulmonary vein. The vena cava carries back to the right auricle of the heart the blood conveyed by the aorta to all the parts of the body, except what goes by the coronary arteries of the heart. It receives all this blood from the arterial ramifications in part directly, and in part indirectly. The vena portæ receives the blood carried to the floating viscera of the abdomen (by the cæliac artery, and the two mesenteric arteries) and conveys it to the hepatic vein, and from thence to the vena cava. The pulmonary vein conveys to the pulmonary sinus, or left auricle of the heart, the blood carried to the lungs by the pulmonary artery.

Q. How is the vena cava distributed ?

A. The vena cava arises with a larger sinus from the right auricle of the heart, where it first sends out a vein to the heart itself, called the coronary vein, and is then divided into two trunks ; one running upward, called vena cava descendens vel superior (because the blood descends through it to the heart) but the ancients, respecting the direction of the tubes or vessels only, called them the reverse, viz. the superior ascendens, and the inferior descendens, The moderns name them as here mentioned, according to the flowing of the blood through them. The descending, or superior trunk, is distributed chiefly to the thorax, head, and upper extremities, and but very little to the parts below the diaphragm. The ascending, or inferior trunk, is distributed chiefly to the abdomen
and

and lower extremities, and but very little to the parts above the diaphragm.

Q. How is the vena cava superior (called also vena cava descendens) distributed?

A. The vena cava superior (called also vena cava descendens) a little higher than the aorta, as high as the cartilage of the first true rib, terminates by a bifurcation or division into the right and left subclavian branches, which are of unequal lengths, because the trunk of the vena cava lies more towards the right side, where the left subclavian arises as well as the right, and is consequently longest. From the heart to the bifurcation of the trunk of the superior cava, arise the following veins, viz. vena (azygos) sine pari, which send branches to the eight lower ribs, and another to the left emulgent vein; 2. intercostalis superior, one on each side, which afford branches to the four upper ribs (if the azygos doth not bestow branches on all the interstices of the costæ) the remarkable veins and arteries as well as nerves relating to the costæ, are couched in a furrow on the under edge of each rib, where they safely pass; 3. bronchialis, which accompanies the bronchial artery to return the blood to the cava. This vein in some subjects indeed, does not rise separate, but comes from the azygos, and sometimes from the intercostals, and in some is altogether wanting. After sending off some small branches, the cava passeth to the clavicle, where it divides itself (as before mentioned) into a right and left subclavian branch, then sends off some small branches to the muscles of the neck and upper

per part of the breast; and these four capital branches, viz. jugularis externa et interna, verna, vertebralis, and axillaris; but this last is rather a continuation than a branch of the subclavian; 1. jugularis externa, chiefly to the external parts of the throat, neck, and head; and its branches receives names from the parts they are distributed to, as frontalis, temporalis occipitalis, &c. 2. jugularis interna, to the internal parts of the head and neck, which gives ramifications to the larynx, pharynx, muscles of the os hyoides and tongue; and besides these, its trunk terminates in a sack, and brings back the blood from the brain and sinuses of the dura mater; 3. vertebralis, which ascends to the cranium through the transverse apophyses of the vertebræ of the neck; and with the cervicalis (which is generally a branch of this vein) supplies the muscles of the neck, accompanying the vertebral artery through all the transverse apophyses of the vertebræ colli, all the way to the great foramen occipitale, communicating with the occipital veins, and small occipital sinuses of the dura mater. The subclavian branch going out of the thorax on each side, is termed, 4. axillaris, which is rather a continuation of the subclavian, than a distinct branch; before it leaves the thorax, it sends off venæ thoracicæ, which are spent on the muscles of the thorax. From the axillaris (after it leaves the capacity of the thorax) branches are sent off to the external and internal muscles of the scapula, &c. and to the axillary glands; and having reached the side of the head of the os humeri,
it

it sends forth *cephalica* to the arm (which creeps along between the skin and the muscles): the *axillaris* then runs along the arm by the name of *vena basilica*; but both this, and the *cephalica*, may be looked upon as two principal branches of the *axillaris*; both are distributed, by numerous ramifications, to all parts of the arm, fore-arm, and hand. At the bend of the elbow (or flexure of the cubit) they form three capital branches; the uppermost is called *cephalica*; the middle, *mediana*, and the next, *basilica*. The vein which runs over the back of the hand, towards the little finger, is called the *salvatella*.

Q. How is the *vena cava inferior* (called also *vena cava ascendens*) distributed?

A. The *vena cava inferior vel ascendens*, is remarkable for its valves, which serve to prevent the blood from returning towards the extremities: it is distributed thus, 1. immediately after it passes out of the pericardium, it perforates the diaphragm, to which it gives the *venæ diaphragmaticæ inferiores*, or *phrēnicæ*; 2. *hepaticæ*, to the liver; 3. *renales vel emulgentes* to the kidneys; 4. *spermaticæ*, to the testicles; 5. *lumbares*, to the loins and their *vertebræ*; after this, the trunk having reached the *os sacrum*, it there loses the name of *cava*; and terminating by a bifurcation like that of the descending *aorta*, it sends off the *vena sacra* to accompany the artery of the same name, and then divides into the two *venæ iliacæ*, each of which is divided into two large trunks, or secondary *iliac veins*: this second bifurcation is about a
finger's

finger's breadth below that of the iliac arteries. The original iliacs are distinguished into the right and left; and the secondary iliacs (which are four trunks) are named external and internal, or anterior and posterior. The two external trunks are also named simply iliaca, and the two internal, hypogastricæ; the former seems to be a true continuation of the original iliac trunk, but the latter only a branch, I mean in adult bodies, for in a foetus there is a manifest difference. From the hypogastrica arise the musculares, hæmorrhoidales externæ, and other branches to the parts of generation, bladder, anus, &c. From the external branches goes the epigastrica to the muscles of the belly and hips; after this, the iliac branches passing out of the abdomen, are termed cruralis, and from thence arise, 1. saphena, passing between the muscles and integuments (only covered with the skin and fat) from the inguen to the knee, ankle, upper part of the foot and great toe; 2. saphena minor, to the back part of the thigh and leg, and to the heel; 3. poplitea, formed of a double crural branch, runs through the ham, on the back of the gastrocnemii to the tendo achillis; 4. tibialis anterior, runs down the fore part of the leg, between the musculus tibialis anticus, and the extensor digitorum communis, to the upper part of the foot; 5. tibialis posterior vel suralis, is distributed through the calf and back part of the leg (as the anterior is on the fore-part) down to the heel and foot; 6. peronæa, runs down on the inside of the fibula as low as the outer ankle; sometimes double

double, sometimes triple, sending ramifications to the neighbouring portions of the musculi peronæi and long flexors of the toes.

Q. How is the vena portæ distributed?

A. The vena portæ, in its structure, has some resemblance to a tree, being divided into innumerable branches, which are dispersed throughout the whole substance of the liver. Where the trunk begins to divide, it constitutes the sinus portæ in the liver, and from this proceeds the numberless ramifications as before mentioned. The roots, or inferior branches of this vein, are divided into right and left; but first the trunk sends off, 1. cysticæ gemellæ, to the vesica fellis; 2. gastrica dextra, to the stomach; 3. duodenalis vel intestinalis, to the intestinum duodenum; and from this last often proceeds the pancreaticæ. From the right branch (before-mentioned) arise, 1. mesentericæ, to the mesentery and intestines; 2. hæmorrhoidalis interna, to the rectum; 3. epiploicæ dextræ, to the caul, the right side of the cæliac artery. From the left branch, which passeth to the spleen and is called splenica, arise, 1. gastricæ (which are various); 2. coronaria ventriculi, proceeding from the former, and distributed on the stomach; 3. vasa brevia, which are formed by some of the branches of the coronaria ventriculi and splenica; 4. epiploica sinistra, and 5. gastro-epiploicæ, to the caul and stomach, the left side of the cæliac artery; 6. pancreaticæ, to the pancreas; and sometimes also the hæmorrhoidalis interna. All venal branches may be accounted the roots, in regard that their lesser

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branches

branches first reſorb the reſiduouſ blood depoſited in any part by the arteries, and carry the ſame into their greater branches, and ſo into the trunk : thus the blood is carried by the veins and their branches to the liver ; and from all parts of the body by the branches of the cava into its aſcending and deſcending trunk, which convey it to the heart. The diſtribution of the veins is ſo various, that it is rare to ſee ſubcutaneous veins in any two perſons alike.

Q. How is the vena pulmonaris diſtributed ?

A. The vena pulmonaris ariſes from the left ventricle of the heart, where it firſt forms a ſinus, then is divided into four branches, and afterwards into innumerable ramifications, which are diſtributed through the whole ſubſtance of the lungs, and accompany the pulmonary artery, to return the blood into the heart.

Q. What are nerves ?

A. The nervous ſyſtem conſiſts of the brain, cerebellum, medulla oblongata, medulla ſpinalis, and the nerves, with their ganglia. But the nerves are bundles of whitish, cylindrical fibres, ariſing from the medulla oblongata of the brain, and the medulla ſpinalis, from which they go out in pairs like ſo many diſtinct trunks, and are afterwards divided into branches, ramifications, and filaments; and terminate in all the ſenſitive parts of the body, being the immediate organs of ſenſation. They are all wrapt up in the dura and pia mater, which laſt covers all the nerves in common, and alſo incloſes every fibre (of which they are compoſed) in particular. To theſe membranous coats, an infinite
number.

number of vessels, both arteries and veins, are distributed. Though the nerves do not appear through the best microscope to have any cavity or fluid contained in them, yet it is possible (and indeed it is the general opinion) that there may be such cavities, and also highly probable (from the experiments of Bellini and others) that there is such a fluid, though too subtile to be perceived by us. This fluid (named animal spirits) is supposed to be conveyed by the nerves to all parts of the body, being an extreme subtile fluid, secreted in the brain and spinal marrow, and is thought to be destined for no less noble a purpose than the sensation, motion, and nutrition of the several parts of the human structure. But the existence of this fluid and the cavity of the nerves, are still the subjects of dispute, though I am inclined to favour both. Those who deny animal spirits in the nerves, suppose that the sensation is conveyed by vibration, which, though it seems to me improbable, yet it is possible it may be conveyed either or both ways (though at present undetermined) and probably some nerves may be so small, as to escape even microscopical observation likewise. The harmony and sympathy of the nervous parts is of great use in physic; for without an accurate knowledge of this, many symptoms of diseases can scarcely be explained. There is a wonderful connection, sympathy, and communication of motion as well as sensation, when they are affected by any violent cause; all which is owing to the nerves; for when any violence is offered them, so as to threaten a solu-

tion of union, it creates a pain and stricture of the adjacent and even of the remote parts, especially of the vessels. The nerves generally run as strait as the parts of the body and their own safety from external injuries will admit, sending off their branches at very acute angles, and consequently running more parallel than the blood-vessels; and I am inclined to think that every the minutest nerve, terminating in any part, is a distinct cord from its origin, or else I do not see how they could produce distinct sensations in every part of the body; and the distinct points of sensation throughout the body are so very numerous, that the whole body of nerves (which, taken together, would not make a chord of an inch diameter) must be divided into such a number, to afford one for every part that has a distinct sensation, that surely such a nerve would be too small to be seen by the best microscope.

Q. How are the nerves divided?

A. The nerves are divided into those which come immediately out of the cranium from the brain; and those which come out between the vertebræ from the medulla spinalis.

Q. How are the nerves from the brain distributed?

A. The nerves from the brain, or medulla oblongata, are ten pair, and are thus distributed, viz. 1. the olfactory pair, which passing through the os cribrosum, vel ethmoides, vel cribriforme, are spread over the membrane of the nostrils; 2. the optic pair, which, by their expansion, form the retina of the eye; 3. the
motory

motory pair of the eyes, each of which is divided near the orbit into six parts or branches; the first branch goes to the elevator palpebræ; the second, to the elevator oculi; the third, to the depressor; the fourth, to the adducens; the fifth to the obliquus inferior; and the sixth, into the tunics of the eye; 4. the pathetic pair, are very small, and run to the obliquus superior, or trochlear muscle of the eye; 5. the gustatory pair, which are very large, and divided within the cranium into three branches, immediately under the dura mater: of these, the first branch, called the ophthalmic, runs to various parts of and about the eye, the eye-lids, the muscles of the forehead and nose, and the integuments of the face; the second branch may be called the superior maxillary one, as being finally distributed through all parts of the upper jaw, the lips, nose, palate, uvula, gums and teeth; a branch of it also runs to the ear, and, joining with a branch of the seventh pair, forms the chorda tympani; the third branch may be called the maxillaris inferior, as being distributed over the several parts of the lower jaw, the tongue, and other parts of the mouth; whence the whole pair of nerves has obtained the name of par gustatorium; though a great part of them serves to very different purposes, and is carried to parts that have nothing to do with tasting; 6. the abducent pair (except a branch for the formation of the intercostal nerve) is wholly carried to the abducens oculi; whence its name. The intercostal nerve is formed either of ramifications of the two preceding nerves,

or only of those of the sixth pair. It makes its way out of the cranium by the passage of the internal carotid, and descends near the eighth pair through the neck, and thence through the breast and abdomen, even to the pelvis, making in its way, various plexuses and ganglia, and sending branches to almost all the parts contained in the breast and abdomen; 7. the auditory pair arise with two trunks, one of which is called the portio dura, and the other portio mollis: this last enters the foramen of the os petrosum; and thence, through various little apertures, gets into the labyrinth of the ear, where it is expanded over all its parts, and constitutes the primary organ of hearing. The harder portion, passing through the aquæductus Fallopii, sends back one branch into the cavity of the cranium; it also sends off another branch, which helps to form the chorda tympani, and others, to the muscles of the tympanum; the rest of this pair goes to the external ear, the pericranium, the muscles of the os hyoides, the lips, the eye-lids, and the parotids; 8. the par vagum, with the accessorius Willisii, pass out near the lateral sinuses of the dura mater; and descending through the neck and thorax to the abdomen, send out branches by the way to the larynx, the pharynx, heart, lungs, and especially to the stomach; it also sends off, from the upper part of the thorax, large branches, which are variously implicated in the neck, thorax, and abdomen; with the linguals, the cervicals, and the intercostals; 9. the lingual pair go immediately to the tongue,
and

and are called by some, the motory nerves of the tongue ; but by others, with more justice, the gustatory nerves ; 10. this pair comes out from the beginning of the medulla spinalis, betwixt the os occipitis and first vertebra colli, and is all, except what goes to the ganglion of the intercostal, spent on the muscoli obliqui, and extensores capitis. But we are to observe, says Heister, that the pair of nerves which the generality of writers have called the tenth pair of the head, are, for many unanswerable reasons, to be properly called the first pair of nerves of the neck.

Q. How are the nerves from the medulla spinalis distributed ?

A. The nerves which come out between the vertebræ from the medulla spinalis are generally reckoned thirty pair, viz. the nerves of the neck are eight pair ; the nerves of the back, twelve pair ; the nerves of the loins, five pair ; and those of the sacrum form five or six pair, though not always determinately and regularly so. From the nerves of the neck are innumerable branches distributed through the muscles of the head, neck, scapula, and humerus ; from the third, fourth, and fifth pair, are formed the nerves of the diaphragm ; and the sixth, seventh, and eighth pair, together with the first pair of the back, form the six robust nerves of the arms and hands ; to this division are the accessory spinal nerves of Willis to be referred, which arise about the origin of the third or fourth pair. The nerves of the back, besides the branch

they give to the brachial nerves, run entirely in the same furrow along the course of the ribs, and are dispersed over the pleura, the intercostal, pectoral, and abdominal muscles, the breast, and other parts of the thorax. The nerves of the loins are generally dispersed over the loins, the peritonæum, integuments and muscles of the abdomen; and besides this, their first pair often gives on each side, a branch to the diaphragm; the second pair, after inosculating with the branches of the first, third, and fourth pairs, forms the crural nerves, which are distributed over the anterior part of the thigh; and in the same manner a branch is formed of the conjunctions of the second, third, and fourth pairs, which passes through the great foramen of the os pubis, to the scrotum, testicles, and the adjoining parts; the fourth and fifth pair of the nerves of the loins, joining with the first, second, third, and fourth pair of the os sacrum, compose the nerve called ischiatic, which is the largest in the body; it descends along the hinder part of the thigh, and its branches are distributed over the whole leg, the foot and toes. The nerves of the sacrum form five or six pair, and pass through the foramina of this bone: the superior of them, as I have already observed, compose the ischiatic nerve; and what remains, is dispersed in a multitude of ramifications over the parts contained in the pelvis, the intestinum rectum, the bladder, the parts of generation, and the parts adjacent.

(See the Tables of the Arteries, Veins, and Nerves)

Q. What

Q. What are lymphæducts, or lymphatic veins?

A. Lymphæducts, or lymphatic veins, are fine transparent tubes or vessels, which carry lymph from all parts, especially the glands, which they discharge into the thoracic duct, and through it into the blood by the left subclavian vein. Though the coats of these vessels are very thin they are strong. Both the lymphatic and lacteal vessels have a dense internal coat which is smooth and polished on the inside; this is connected to a middle coat by a reticular substance; and the outer coat is a membrane somewhat similar to the pleura or the peritonæum. They are not continuations of arteries, but have their origin in all the cavities and cellular substance of the body; they are more numerous in glands than other parts, especially in those glands which separate the viscidest fluids, as may be observed in the liver and testes. The lymphatics have many valves at small and uncertain distances, to prevent the regrefs of their fluid; and they have frequent communications, like the veins. The larger trunks are in many places attended with small glands, through which they run, and at the same time send communicant branches over them, as a security against obstructions from diseases in those glands: they all ultimately terminate in that part of the thoracic duct called the receptaculum chyli. The coats of the lacteal and lymphatic vessels, have in common with all other parts of the body, arteries, and veins for their nourishment. They have also nerves from the
blood

blood vessels running through them, they are subject to inflammation, and from their numerous nerves they are as irritable as any vessels in the body.

Q. What are the uses of the lymphatics?

A. The use of the lymphatics is to dilute the chyle and absorb the fluids which are thrown into the several interstices of the body, thereby preventing any morbid accumulation. When a lymphatic vessel bursts, it occasions a dropsy in the cavity into which it opens. The lymphatics are perfectly similar to the lacteals. The lacteals are the absorbents of the intestines, as the lymphatics are of the other parts; there is no difference but the name. The same vessels are called lacteals in the intestines, and lymphatics in the other parts of the body.

Q. What are glands?

A. Glands are small bodies formed by the interweaving of vessels of every kind, covered with a membrane; generally composed of an artery. They have been defined to be appendages to the sanguiferous, and lymphatic systems, and that have the power of inducing changes on the fluids that are brought to them, or separating particular parts from the general mass. The glands are of two kinds, viz. the simple, called conglobate glands; and the compound, named conglomerate glands. Some glands are considerably hard and firm; others very soft and tender; of the latter kind in particular are the glands in the articulations of the bones. The glands differ very considerably in colour, figure, and size; some take their names from their peculiar figure; as the glandula pinealis,

nealis, the miliares, and others; some, from their use and contents, as salival glands, mucose and lymphatic, &c. and others take their names from their situation; such are the parotid glands, axillary, inguinal, mesenteric, lingual, &c.

Q. What are the uses of the glands?

A. To secrete fluids from the mass of blood for divers purposes, such as perfecting the lymph, &c. Their uses are as different as their colours or figures; some of them are salival, mucose, and lymphatic; others are mucilaginous, sebaceous, and waxy; others lachrymal, pituitary, &c. and from these their several contents or secretions, they are termed lachrymal, &c.

Q. What is a conglobate gland?

A. A conglobate gland is a little smooth body wrapt up in a fine skin or membrane, by which it is separated from all other parts, only admitting an artery and a nerve to pass in, and giving way to a vein and excretory canal or duct, to come out; of which sort are the glands of the brain and testes. Winslow includes, under the name of conglobate glands, the lymphatic glands alone, and calls all the other glands of the body by the name of conglomerate.

Q. What is a conglomerate gland?

A. A conglomerate gland is that which is composed of several little conglobate glands, all tied up together in one common tunicle or membrane. Sometimes all their excretory ducts unite, and make one common pipe, through which the liquor of them all runs, as the pancreas

creas and parotides do. Sometimes the ducts uniting, form several pipes, which only communicate with one another by cross canals; and such are the mammæ; others again have several pipes without any communication with one another; of which sorts are the glandulæ lachrymales, and prostatae; and a fourth sort is, when each little gland has its own excretory duct, through which it transmits its liquor to a common basin; as the kidneys,

Q. What are excretory vessels?

A. Excretory vessels are either tubes from glands to convey the secreted fluids to their respective places; or vessels from the small guts to carry the chyle to the blood vessels; these last are called vasa lactea, or lacteal vessels.

Q. What are the lacteal vessels?

A. The vasa lactea, or lacteal vessels, are the venæ lactæ, receptaculum chyli, and ductus thoracicus, filled with a white milky fluid, called chyle.

Q. What are the venæ lactæ?

A. The venæ lactæ, &c. have the name of veins, because their valves are disposed as the ordinary blood veins, and because the fluid which they contain runs from smaller into larger tubes or vessels. The lacteal veins are long, slender pipes, whose coats are so thin as to become invisible when they are not distended with chyle. They arise from all the parts of the small guts, by a vast number of fine capillary pellucid tubes, which, as they run from the sides of the intestines to the glands in the mesentery,

mentery, frequently unite, and form fewer and larger branches (called *venæ lacteæ primi generis*) which pass through the glands of the mesentery; and from these arise other lacteals of a larger size (named *lacteæ secundi generis*) which carry the chyle immediately into the receptaculum chyli. The mouths of these lacteals, which are open into the cavity of the guts, from whence they receive the chyle, are so small, as not to be seen by the very best microscope; it was necessary they should be smaller than the finest arteries in the body, that nothing might enter which could stop the circulation of the blood. The same extremity of the lacteals has likewise communication with the capillary arteries of the guts, by which they receive a lymph that dilutes and propels the chyle forwards, and washes the lacteals and glands, that they may not be obstructed by the chyle's staying in them upon fasting. The other extremity of the lacteals discharges the chyle into the vesicular cells of the mesenteric glands, &c. as I have before mentioned. The lacteal veins have valves at certain distances, which hinder the chyle from returning back into the intestines. The office of these veins is to receive the fluid part of the digested aliment, which is called chyle, and convey it to the receptaculum chyli, that it may be thence carried through the ductus thoracicus into the blood vessels.

Q. What is the receptaculum chyli?

A. The receptaculum chyli is a membranous somewhat pyriform bag, two thirds of an inch long,

long, one third of an inch over in its largest part when collapsed; situated on the first vertebra lumborum to the right of the aorta, a little higher than the arteria emulgens dextra, under the right inferior muscle of the diaphragm. It is formed by the union of three tubes; one, from under the aorta; the second, from the interstice of the aorta and cava; the third, from under the emulgents of the right side. It lies between the descending trunk of the aorta and the above vertebræ, and is biggest between the cæliac and emulgent arteries, surrounded by vesicular glands, called glandulæ lumbares, which discharge their lymph into it. The receptacle receives all the second order of the lacteals, as well as all the lymphatic veins, both of the legs and of all parts of the abdomen. This sacculus chyloferus will contain about one ounce of water; at its superior part becoming gradually smaller, it is contracted into a slender membranous pipe, of about a line diameter, called the ductus thoracicus.

N. B. Anatomists have usually described a receptaculum chyli, but there is no such thing in the human subject; the thoracic duct is indeed something larger here than above, but is nothing more.

Q. What is the ductus thoracicus?

A. The ductus thoracicus, or thoracic duct, is the superior part of the receptaculum chyli contracted into a slender, membranous pipe, of about a line diameter, which passes between the appendices musculosæ diaphragmatis, on the right of, and somewhat behind the aorta, then
lodged

lodged in the cellular substance under the pleura; it mounts between this artery and the vena *sine pari*, or *azygos*, as far as the fifth *vertebræ thoracis*, where it is hid by the *azygos*, as this vein rises forward to join the *cava descendens*; after which, the duct passes obliquely over to the left side under the *œsophagus*, *aorta descendens*, and great curvature of the *aorta*, until it reaches the left *carotid*, stretching farther towards the left *internal jugular*, by a circular turn, whose convex part is uppermost; at the top of this arch it splits into two, for one half line; the superior branch receiving into it a large lymphatic from the *cervical gland*. This lymphatic appears, by blowing and injections to have two valves: when the two branches are united, the duct continues its course to the *internal jugular*, behind which it descends; and immediately at the left side of the insertion of this vein, enters the superior and posterior part of the left *subclavian*, whose internal membrane duplicated, forms a semilunar externally convex valve, that covers two thirds of the orifice of the duct: immediately below this orifice a *cervical vein*, from the *musculi scaleni*, enters the *subclavian*. The *ductus thoracicus* has a thin coat, and valves, at several distances (commonly ten or twelve) which hinder the chyle that has once passed them, from falling back. The diameter of the duct varies in most bodies; and in the same subject is uniform: but frequently sudden enlargements, or *sacculi* of it, are observable. The divisions which authors mentioned of this duct within the thorax

rax, are very uncertain ; as is the precise vertebra, where it begins to turn towards the left. Frequently it does not split at its superior arch ; in which case, a large sacculus is found near its aperture into the subclavian vein : generally it has but one orifice, though I have seen two in one body, and three in another ; nay, sometimes it divides into two, under the curvature of the great artery, one going to the right, another to the left subclavian : this, however, is very rare. The lymphatic which enters the superior arch, is often sent from the thyroid gland. The thoracic duct receives the lymphæducts from the several parts of the thorax, as it passes along to the subclavian vein : by its running up to the left side, the chyle receives a new impetus from the pulsation of the aorta ; whereas, on the right side, it must have ascended only by the pressure of the diaphragm, and the muscles of the lower belly upon the receptacle, which it equally enjoys in its present situation. The receptaculum chyli is easily found in living bodies, but with greater difficulty in those that are dead.

Q. What are membranes ?

A. Membranes are a pliable texture of fibres interwoven together, and expanded, to cover or line any other part. Every distinct part of the body is covered, and every cavity is lined with a single membrane, whose thickness and strength is as the bulk of the part it belongs to, and as the friction to which it is naturally exposed. The membranes of the body are various, and variously denominated : those which serve

as integuments, or covers of vessels, are called tunics or coats; those that cover the brain, meninges; the skull, pericranium; the bones in general, periosteum; that which lines the thorax, pleura; the abdomen, peritonæum; and that which includes the heart, pericardium. The muscles too, are each inclosed in a peculiar membrane; as are the bowels, &c.

Q. What are the uses of the membranes?

A. The uses of the membranes are to cover and wrap up the parts, strengthen them, and save them from external injuries; those that contain distinct parts, keep the parts they contain together, and render their surfaces smooth, and less subject to be lacerated by the actions of the body; and those which line cavities serve to render the cavities smooth and fit for the parts they contain to move against. The membranes are not only of use to join one part to another, but also to preserve the natural heat, to sustain small vessels, and the nerves, which run through their duplicatories; to stop the returning of the humours in their vessels (as the valves stop the returning of the blood in the veins and heart) of the chyle in the thoracic duct, and of the lymph in the lymphatic vessels. The membranes of all the cavities that contain solid parts, are studded with glands, or are provided with vessels which separate a mucus to make the parts contained move smoothly against one another, and not grow together; and those cavities which are exposed to the air, as the nose, ears, mouth, and the trachea arteria, have their membranes beset with

E

glands

glands which separate matter to defend them from the outer air.

Q. What are fibres ?

A. Fibres appear to be simple, thread-like bodies, which serve to form other parts ; hence some are very hard, as the bony ones ; and others soft, as the fleshy parts.

Q. What is hair composed of ?

A. Of five or six oblong, slender, flexible filaments, inclosed in a tube, and transparent, growing out of the pores, and is either strait or crooked, according to the rectitude or obliquity of the pores.

Q. What are nails ?

A. A kind of bony excrescence growing on the fingers and toes ; according to some their substance consists of the cutaneous papillæ, elongated and indurated in that form : others say that they are a continuation of the epidermis. This last opinion agrees with experiments made by maceration, by means of which the epidermis may be separated entire from the hands and feet, like a glove or sock. In this experiment we see the nails part from the papillæ, and go along with the epidermis, to which they remain united like an appendix : and yet their substance and structure appears to be very different from that of the epidermis. Their substance like that of a horn, and they are composed of several planes of longitudinal fibres, foldered together. The graduated extremities or roots of all the fibres of which these planes consist, are hollowed for the reception of the same number of very small oblique papillæ, which

which are continuations of the true skin, which having reached the root of the nail, forms a semilunar fold in which that root is lodged. After this semilunar fold, the skin is continued on the whole inner surface of the nail, the papillæ insinuating themselves into the hollows of the fibres of the nails. The fold of the skin is accompanied by the epidermis to the root of the nail exteriorly, to which it adheres very closely. Three parts are generally distinguished in the nail, the root, the body, and the extremity. The root is whole, and in the form of a crescent; the body of the nail is naturally arched, transparent, and appears of the colour of the cutaneous papillæ which lie under it. The extremity of the nail does not adhere to any thing, and still continues to grow as often as it is cut. The principal use of the nails is to strengthen the ends of the fingers and toes, and to hinder them from being inverted towards the convex side of the hand or foot, when we handle or press any thing hard. The nails thus serve for buttresses rather than for shields. The nails are neither vascular nor sensible.

D I A L O G U E II.

Of the HEAD and its PARTS.

Q. **W**HAT are the parts of the head, and how distinguished?

A: The hair is termed capillus; that part which it covers is termed the scalp; the crown of the head, vertex; the hinder part, occiput; the fore-part, sinciput; that part between the hair and the eye-brows, frons, the forehead; the sides of it tempora, the temples; the eye-brows, supercilia; the space between the eye-brows, glabella; the eye-lids (both upper and lower) palpebræ superior et inferior, and the cartilaginous edges of both, with the hairs growing thereon, are termed cilia; the hollow of the eye, cavum oculi; the inner angle of the eye, canthus major; the outer corner of the eye, canthus minor; and the eye, oculus; which consists of proper tunics and humours. The ridge of the nose is termed spina nasi; the tip of the nose, orbiculus, vel globulus nasi; the nostrils, nares; the partition between them, septum nasi; the sides of the nostrils, alæ; the hairs growing within, vibrisæ: internally, the maxillary, sphenoidal, and frontal sinuses. The outer ear is termed auricula, but more properly auris externa: in this there are a great many eminences and cavities; the upper part is termed pinna; the lower part, lobus, or fibra; the
outer

outer circle, helix; the inner circle (or semicircle) antihelix; the space between the two circles, scapha; the lower end of the antihelix, or semicircle, makes a little prominence, which is called antitragus, because there is another prominence just opposite to it, called tragus; the cavity made by the extremity of the helix, is called concha; the hollow of the middle of the ear, is termed alvearium, and has a hole or passage into the internal ear, named meatus auditorius. The upper jaw is termed maxilla superior; the prominent part of the cheek, mala; the lower jaw, maxilla inferior; the hollow, or the cheeks stretched out in blowing, bucca; the chin, mentum; the beard, or place where it grows on the upper-lip, mystax; the gutter in the middle under the nose, is philtrum. The external parts of the mouth are the lips, one upper, and the other under: the internal parts are the gums, termed gingivæ; the teeth, dentes; the tongue, lingua; the roof of the mouth, palatum; with the uvula there suspended for modulating the voice, &c. The other internal parts of the skull, eye, nose, ear, and mouth; such as the brain, glands, membranes, muscles, &c. I shall speak of hereafter in the particular descriptions of these parts.

Q. What are the bones of the head?

A. The bones of the cranium or skull, which contains the brain, &c. the bones of the face, jaws, teeth, tongue, and internal ear.

Q. What are the bones of the cranium?

A. The bones of the cranium are but eight; though if we reckon the ossa petrosa distinctly

from the ossa temporum, they are ten, viz. os frontis, ossa parietalia, two ; ossa temporum, two ; os occipitis, os ethmoides, os sphenoides.

Q. Which is the os frontis ?

A. The os frontis is situated in the fore-part of the skull, and forms that part of the face called the forehead ; from whence its name. It is joined by suture to the ossa parietalia, unguis vel lachryma nasi, maxillaria, malarum, os ethmoides et sphenoides. The os frontis contains the anterior lobes of the brain : in its middle there is generally a ridge, or spine, to strengthen it, and to which the longitudinal sinus of the dura mater adheres ; and from the middle of this bone externally, goes a process to support the bones of the nose ; and the lower parts of the os frontis compose the upper parts of the orbits of the eyes. Immediately above the os ethmoides is a small blind hole, through which runs a vein to the longitudinal sinus of the dura mater, and through the upper edge of each orbit, nerves, and an artery, pass to the forehead ; and in each orbit, near the os planum, passes a branch of the fifth pair of nerves. These vessels in some skulls make furrows in the os frontis, especially in the bones of children ; we should therefore beware of transverse incisions on either side of this bone, which might either open these vessels, or hurt the nerves, while they are yet in part within the bone ; for when vessels are thus wounded, it is difficult to stop the hæmorrhage, because the adhesion of a part of the artery to the bone hinders its contraction, and consequently styptics can have but
little

little effect; the sides of the furrow keep off compressing substances from the artery; and cauteries should be shunned, because they render the bone carious, and by hurting the nerves, cause convulsions. In the substance of this bone, near the nose, are several sinuses, more in some subjects than in others; in children seldom any. These sinuses, and the spine in this bone, render it dangerous, if not impracticable, to apply a trephine on the middle and lower part of the forehead.

Q. What are the ossa parietalia?

A. The ossa parietalia (by some named bregmati, or sincipitis) are two bones larger than any other in the skull, forming the superior and lateral parts of it, and to which the temporal muscles are partly fixed. Near the upper sides of these bones, towards the hind parts, is a small hole in each, through which a vein passes from the integuments of the head to the longitudinal sinus. Sometimes a branch of the temporal artery passes through this hole, to be distributed to the upper part of the falx, and to the dura mater at its sides, where it had frequent anastomoses with the branches of the arteries derived from the external carotids, which commonly have the name of the arteries of the dura mater, and with the branches of the internal carotids which serve the falx. In many skulls, one of the ossa parietalia has not this hole; in others, there are two in one bone, and in some, not one in either. Most frequently this hole is through both tables; at

other times the external table only is perforated. The knowledge of the course of these vessels may be of use to surgeons when they make any incision near this part of the head ; lest, if the vessels are rashly cut near the hole, they shrink within the substance of the bone, and so cause an obstinate hæmorrhage, which neither compress nor ligatures can stop. On the inner concave surface of these bones, and more particularly near their lower edge, are many deep furrows which sometimes form deep canals. In some skulls, a large furrow begins at the hole near the upper edge, and divides into branches. In a child born at the full time, none of the sides of these bones are compleated ; and there never is a hole in the ossified part of it near to the sagittal suture. All the bregma is generally ossified before seven years of age.

Q. Which are the ossa temporum?

A. The ossa temporum, vel squamosa, are two bones situated below the parietal bones, at the middle and lower parts of the sides of the skull, from which proceed the mammillary and zygomatic processes ; and it has an exterior sinus lined with a cartilage, which receives the process of the lower jaw.

The ossa petrosa lie between the former and the occipital bones, or are truly portions of the temporal bones, being never found separate in adult bodies. In each of these bones there is an external and an internal process ; the former is named styloformis ; near it is the sixth foramen, through which the carotid arteries pass to the brain ; and that on the inside of the skull,
leading

leading to the organs of hearing, is the seventh foramen; the latter process is called the os petrosum, which contains the whole meatus auditorius and cavity of the tympanum. In an infant, a small fissure is to be observed between the thin upper part and the lower craggy part of each temporal bone; neither mastoid nor styloid processes are yet to be seen. Instead of a bony funnel like external meatus auditorius, there is only a smooth bony ring, within which the membrane of the drum is fastened. At the entry of the eustachian tube, the side of the tympanum is not completed.

Q. Which is the os occipitis?

A. The os occipitis makes all the back part of the skull; it is bounded by the sphenoidal, temporal, petrosal, and parietal bones. This bone is articulated to the spine; and between its apophyses is the great or tenth foramen, thro' which the medulla oblongata descends into the spine, and the cervical arteries and vein pass; on the inside of this bone is a crucial spine; and on the outside a spine, or an apophysis, to strengthen it: the thinner parts of this bone are also defended by the muscles that cover them, as blows here are of worse consequence than on any other part of the skull; because wounds in the cerebellum, which is underneath, are mortal. Near the apophyses of this bone is the ninth foramen of the skull, through which pass the ninth pair of nerves; and behind each apophysis of the occipital bone there is a foramen, or a sinus, through which pass sinuses from the lateral sinuses of the external cervical veins,
by

by means of which (as in all other communications of the sinuses) the blood passes from those that happen to be surcharged by any posture of the head, into those that, from the same posture, would have been almost empty.

Q. Which is the *os ethmoides* ?

A. The *os ethmoides*, vel *cribriforme*, is a small bone, about two inches in circumference, lying in the fore part of the skull, and almost surrounded by the *os frontis*. It is full of holes like a sieve; it is a principal part of the organ of smelling, and gives a very great extent to the pituitary membrane in a small compass; in the middle of this bone is the *crista galli* process, and opposite to it a thin one, which in part divides the nose. When the *crista* is broke its base is sometimes found to be hollow, with its cavity opening into the nose. The process which descends and divides the cavity of the nose, is often not perpendicular, and sometimes inclines so much to one side, that with its flexure in its middle part it fills up a large share of one of the nostrils, and has been mistaken for a polypus there.

Q. Which is the *os sphenoides* ?

A. The *os sphenoides* is fixed like a wedge in the midst of the *os frontis*, *ethmoides*, *vomer*, *occipitis*, *maxillæ superioribus*, *ossa parietalia*, *palati*, *malorum*, *temporum*, and *petrosum*: on its inside is a cavity, named *fella turcica*, vel *equina*, and the four clinoid processes; under the two foremost of which, pass the internal carotid arteries: opposite to the *fella turcica* is a process, which makes part of the *septum narium*:

rium: on the outside of the skull, adjoining to the upper jaw, are the pterygoid processes; under the sella turcica, vel equina, in this bone is the sphenoidal sinus, which is sometimes double, and opens into the nostrils; but sometimes it is totally wanting, especially in children. At the inside of the basis of the two anterior clinoid processes, are the first foramina of the skull, through which the optic nerves pass: near this is the second foramina, through which pass nerves and blood-vessels into the orbits of the eyes; and towards the occiput are the third foramina, through which pass nerves to the face; nearer the occiput are the fourth foramina, through which pass the largest branches of the fifth pair of nerves; and a straw's breadth farther are the fifth foramina, through which those branches of the carotid arteries enter, that are bestowed upon the dura mater.

Q. How are the bones of the skull composed?

A. They are of unequal thickness in the several parts, and are composed of two lamellæ, or tables, laid over one another; between which there is a diploe, or mediotullium, being a thin spongy substance, made of bony fibres detached from each lamina, and full of little cells. The tables are hard and solid, the fibres being close to one another. The diploe is soft, the bony fibres being here at a greater distance (a contrivance of the all-wise Creator's) whereby the skull is not only made lighter, but less liable to fractures. The diploe of several old subjects is so obliterated, that scarce any vestige of it

it can be seen; neither is it observable in some of the hard craggy bones at the base of the skull. Hence an useful caution to surgeons who trust to the bleeding, want of resistance, and change of sound, as certain marks in the operation of the trepan, for knowing when their instrument has sawed through the first table, and reached the diploe. In other people the diploe becomes of a monstrous thickness, while the tables of the skull are thinner than paper. The external lamina of the cranium is smooth, and covered with the pericranium, which in other bones is called by the general name of periosteum, because of its adhering to the bone: it is found connected to the dura mater by fibres transmitted from it to that membrane through the sutures. About the origin of the temporal muscles the coats of the pericranium part; the outer passing over those muscles, and the inner still adhering close to the cranium. The internal lamina of the cranium, or inside of the skull, is likewise smooth, except the furrows made by the pulsation of the arteries of the dura mater before the cranium was arrived at its consistence. Surgeons should be cautious when they trepan here, lest, in sawing or raising the bone where such furrows are, they wound these vessels. All the bones of the cranium are found to be imperfect in new-born infants; the sinus and its medullium are almost wholly wanting.

Q. What are sutures?

A. Sutures are the closing or joining together the bones of the skull, like the teeth of saws

saws set one into another; and these are either common or proper; the proper futures are distinguished into the true, and the false or spurious.

Q. Which are called true futures?

A. They are called true futures which are denticulated mutually into each other with a multitude of saw-like teeth, and are most plainly to be seen; such are the coronal, sagittal, and lambdoidal futures.

Q. Which are the false, or spurious futures?

A. The false, or spurious futures, are those squamose ones of the temporal and parietal bones, and of the os frontis and sphenoides in the angle where they unite with the parietals.

Q. Which are the common futures?

A. The common futures are the transversal ones, which join the os frontis with the bones below it; but these are of little moment.

Q. Which are the coronal futures?

A. The futura coronalis runs across the skull from one upper edge of the sphenoidal bone to the other, and joins the parietal bone to the frontal. Though the indentations of this future are conspicuous in its upper part, yet an inch or more of its end on each side hath none of them, for it is squamous and smooth there.

Q. Which are the sagittal futures?

A. The futura sagittalis joins the parietal bones, beginning at the os occipitis, and is continued to the os frontis; in children down to the nose; the os frontis in them being two bones, and sometimes so in adult bodies.

Q. Which

Q. Which are the lambdoidal futures ?

A. The futura lambdoidalis joins the back part of the ossa bregmatis, or parietal bones, to the upper part of the occipital.

This future is sometimes very irregular, being made up of many smaller futures, which surround so many little bones that are generally larger and more conspicuous on the external surface of the skull than internally. These bones are generally called triquetra or wormiana. These ossa triquetra are sometimes in other futures besides the lambdoidal ; and sometimes they are in one table of the skull and not in the other. In some old skulls there are no remains of the above three futures ; in others one or two of them only appear ; but none are ever met with by modern anatomists, from which to conclude that the futures are ever disposed in such different manners in skulls of different shapes as Hippocrates, Galen, &c. have related.

Q. Which are the squamose futures ?

A. The futura squamosa is made by the upper part of the temporal and sphenoidal bones wrapping over the lower edges of the parietal bones:

Q. Which are the transversal futures ?

A. They run across the face, through the bottoms of the orbits of the eyes ; they join the lower edge of the frontal bone to the os sphenoides, maxillæ superioris, ossa nasi, unguis, palati, and jugalia, or malarum.

Q. What are the uses of the futures ?

A. Not

A. Not only to join the bones of the cranium together, but the skull being thus divided into many bones, renders it less apt to be fractured, and, when it is fractured, they prevent its being extended; as it would have been, were it composed of one bone only. They are also of use to join the dura mater very firmly to the cranium and pericranium in those parts, and for the ossification of the bones; and in infants, that the head may be the more easily extended in its growth, and also that they may give way in the birth: and the openness of the futures in children have another advantage, viz. that medicinal applications to the external part of the head may penetrate and do service; and lastly, that the transpiration from the brain may be the more free and easy at that time of life in which the bones are open, and in which also the habit is more humid. It must be observed, that the indications of the futures do not appear on the inside of the cranium by much so strong as on the outside; but the bones seem almost joined in a straight line; nay in some skulls the internal surface is found entire, while the futures are manifest without.

Q. What use are the foramina, or holes of the skull?

A. To give passage to the spinal marrow, nerves, arteries, and veins.

Q. How are they distinguished?

A. Into external and internal.

Q. Which are the external?

A. The external are meant those which are easily discovered on the outside of the skull.

Q. Which

Q. Which are the internal ?

A. By the internal are meant those which are most obvious in the internal surface of the skull.

Of the larger internal foramina there are eleven pair, affording passage to the arteries, veins, and nerves of the brain; besides these, there is one that is single, viz. the great foramen of the occipital bones, that gives passage to the medulla spinalis, accessory spinal nerves, and vertebral arteries: 1st pair, gives passage to the olfactory nerves; 2d pair, to the optic nerves; 3d pair, to the third and fourth pair of nerves, to the first branch of the fifth pair, and to the sixth pair, as also to the emissary of the receptacles of the dura mater; 4th pair, give passage to the second branch of the fifth pair of nerves, which is distributed to the several parts of the upper jaw; 5th pair, to the third branch of the fifth pair of nerves, and to the emissary of the dura mater; 6th pair, give passage to an artery (which is distributed over the dura mater, and is that which forms the tree-like impressions on the inside of the parietal bones); 7th pair, is between the fella equina and the petrose apophysis, and is shut up by the dura mater; 8th pair, give passage to the carotid arteries; and here the intercostal nerve goes out; 9th pair, to the auditory nerves; 10th pair, to the par vagum, the lateral sinuses of the dura mater, and to the spinal nerve; 11th pair give passage to the lingual nerves: besides these large foramina, there are a number of little ones often very visible.

Q. What

Q. What external foramina are there ?

A. Two of the os frontis a little above the orbits, called supra orbitalia ; they give passage to the opthalmic nerve of Willis ; there are also four others, two on each side the orbit, which transmit little nerves and vessels to the sinus of the os ethmoides ; in the parietal bone one, though sometimes none ; in each of the ossa temporum, three common and three proper : the first is the foramen jugale for the passage of the temporal muscle ; in the 2d is the sinus of the jugular vein ; and the 3d is the ductus Eustachii, situated between the petrosum and the sphenoides, and leading from the mouth into the internal ear : besides these, there are also three proper foramina in the ossa temporum ; 1st the meatus auditorius ; 2d the aquæduct of Fallopius, situated between the mastoide and styloide processes, and transmitting the hard portion of the auditory nerve ; 3d a foramen behind the mastoide process. In the occipital bone are generally two foramina behind the condyloide apophyses for the passage of the vertebral veins into the lateral sinuses of the dura mater. In the sphenoidal bone, besides those already mentioned, are the apertures of the sinuses into the nostrils common to them with the bones of the palate, and which are the apertures of the nares and fauces. In the upper part of the pterygoide processes, is a passage for the novum emissarium of the dura mater. In the os ethmoides, besides those common to this bone with the os frontis (already mentioned)

mentioned) there are the apertures of the ethmoidal sinuses into the nostrils.

Q. What are the bones of the face?

A. The bones of the face are the ossa nasi, malarum, unguis, plana, maxilla superior, palati, os vomer, spongiosum, maxilla inferior; to which may be added, the bones of the ear and tongue.

Q. Which are the ossa nasi?

A. The ossa nasi makes the upper part, or ridge of the nose.

Q. What are the ossa malarum?

A. Two bones situated in the lateral and middle parts of the face, called the cheek bones; the short processes of which, together with the processus jugalis, form arches, called the ossa jugalia, vel zygomaticus.

Q. Which are the ossa unguis, vel lachrymalia?

A. The ossa unguis, vel lachrymalia, are two of the least bones of the face, situated in the orbits of the eyes towards the nose, very thin and transparent; between each of them and the upper jaw, is a foramen as large as a goose quill, into which the puncta lachrymalia lead, to carry off any superfluous moisture from the eyes into the nose. This is the part that ought to be pierced in the great operation for the fistula lachrymalis. The situation and tender substance of these bones, make a rash operator in danger of destroying a considerable share of the organ of smelling, when he is performing the operation for the fistula lachrymalis; but when these
bones

bones are hurt, they cast off without difficulty, and the wound is soon cured, unless the patient labours under a general bad habit of body, or that there is a predisposition in the bones to be carious; in which case, a large train of bad symptoms follow, or at best the cure proves tedious.

Q. Which are the ossa plana?

A. Situated also in the orbits beyond the ossa unguis, and are near thrice as big.

Q. Which is the maxilla superior?

A. The maxilla superior, or upper jaw, though generally described single, consists of two bones, being manifestly divided by a suture, which is scarce ever obliterated. Its two processes make part of the nose. Its upper and outward parts make the lower parts of the orbits of the eyes; its lower side, all that part of the face under the cheeks, eyes, and nose, to the mouth, and two thirds of the roof of the mouth. A little below the orbits of the eyes there are two holes in this bone, and behind the dentes incisores one more, which divides into two, as it opens into the nose. Between the posterior grinding-teeth and the orbits of the eyes, are two great sinuses, called antra-maxilla superioris, which open into the upper part of the nose; and in the lower edge of this jaw are the alveoli, or sockets for the teeth. Part of the sides of these sinuses that lie next the nose, are only membranes, which make the cavities like drums; perhaps to give a grave sound to the voice when we let part of it through the nose.

Imposthumations sometimes happen in these sinuses; the signs of which are, great pain about

part, matter in the nose on the side diseased, stinking breath, and rotten teeth; the cure is performed by drawing out the last tooth but one, and drawing two or more, if rotten, and through their sockets making a perforation into the antrum.

The maxillary sinuses have the same uses as the frontal and sphenoidal; and the situation of the sinuses is such that the liquor drilling from them, from the cells of the ethmoid and palate bones, and from the lachrymal ducts, may always moisten all the parts of the membrane of the nares in the different situations which the head is in.

Q. Which are the ossa palati?

A. The ossa palati are two small bones that make the back-part of the arch of the palate, or roof of the mouth; and are continued up the back part of the nostrils: near this bone are two small foramina, through which arteries and nerves pass to the palate.

Q. Which is the os vomer?

A. The os vomer is situated between the bones of the palate and the sphenoidal bone. This bone, together with the two nasal fossæ and its cartilage, are the septum nasi.

Q. Which is the os spongiosum?

A. The os spongiosum, though by some treated as a distinct bone, is only the spongy laminæ in the nose of the os æthmoides and ossa plana.

Q. Which is the maxilla inferior?

A. The maxilla inferior, or lower jaw, is but one bone in adults, but in children two, which

which unite by a cartilage in the middle of the chin, and, as the child grows, hardens into bone; in children it also consists of two tables and a diploe between. This bone forms two condyloid processes; and near these are the two coronal processes; and at the inside of the chin a small rough processus innominatus. In the inside of this bone, under each processus coronalis, is a large foramen, which runs under the teeth, and passes out near the chin; in this foramen the vessels pass that belong to the teeth; and in the upper edge of the jaw are the sockets for the teeth. On account of the vessels and nerves in the lower jaw, fractures of it may be attended with dangerous symptoms.

Q. What number are the teeth, and how are they distinguished?

A. The number in adults, if perfect, is generally thirty-two (sixteen in each jaw); the four fore-teeth in each jaw are called incisores; the next (one on each side the incisores) canini, called by some the eye-teeth; the rest are the molares, or grinders; the last of which (on each side) above and below, are termed dentes sapientiæ, because they do not appear till men arrive at the years of discretion. The incisores and canini have only one single root; the two first of the molares on each side, have two roots, and the rest, some three, some four, especially in the upper jaw, where also they are spread wider, because that jaw being more spongy than the other, the teeth need more space to fix them. The cavities of the teeth are covered or lined with a fine vasculo-nervous membrane; and each

branch of the roots have a foramen, or hole at their bottom, through which pass an artery, vein, and nerve, to afford them nutrition and sensation: these vessels and membrane are the seat of the tooth-ach. Children are seldom born with teeth; but at two years of age they have twenty; and their number does not increase until they are about seven years old, when the teeth that first appeared are thrust out by others, that have been formed deeper in the jaw, and some more of the teeth begin to discover themselves farther back in the mouth. About fourteen years of age, some more of the first crop are shed, and the number is increased. This shedding of the teeth is of good use; for if the first had remained, they would have stood at a great distance one from another, because the teeth are too hard in their outer crust, to increase so fast as the jaws do. Whereas, both the second layer and the teeth that come out late, meeting, while they are soft, with a considerable resistance to their growth in length from those situated upon them, necessarily come out broad, and fit to make that close guard to the mouth which they now form.

Q. Which is the os hyoides?

A. The os hyoides, or bone of the tongue, is situated in the middle space between the angles of the lower jaw, and adheres to the base of the tongue. The os hyoides is generally composed of five small bones; and the use of it is to give a firm basis to the tongue; and therefore several muscles of the tongue and larynx

rynx, serving to the motions of both, are inserted in it.

Q. Which are the bones of the internal ear ?

A. The bony cavity of the tympanum contains several little bones, called the bones of the ear ; which take their names from the things they are thought to resemble, viz. malleus, incus, stapes, and orbiculare ; but this last, in dried bones, passes sometimes unobserved.

Q. Which is the malleus ?

A. The malleus is the hammer-like bone adhering to the membrane of the tympanum, and articulated with the incus,

Q. Which is the incus ?

A. The incus, or anvil-like bone, is articulated both to the malleus and stapes.

Q. Which is the stapes ?

A. The stapes, or stirrup, is a little bone situated in the cavity of the fenestra ovalis ; it is joined to the incus, and its basis adheres (by means of a membrane) to the fenestra ovalis of the labyrinth of the ear.

Q. Which is the os orbiculare ?

A. The orbicular, or lenticular bone, is the smallest bone in the body ; it is articulated with both the stapes and incus.

Q. What are the muscles, cartilages, and ligaments of the head ? I mean those belonging to the cranium.

A. The muscles, cartilages, and ligaments of the cranium, are these, viz. 1. occipito frontalis, orbicularis palpebrarum, corrugator supercilii, ciliaris (tarsi) cartilages and ligaments, and elevator palpebræ superioris ; 2. the muscles of

the globe of the eye, viz. elevator oculi, depressor oculi, adductor oculi, abductor oculi, obliquus inferior, obliquus superior vel trochlearis ; 3. the muscles, cartilages and ligaments of the external ear, viz. cartilage and ligament, elevator auriculæ, anterior auriculæ, retractor auriculæ, helix major, helix minor, tragus, antitragicus, transversus auriculæ ; 4. the muscles of the internal ear, viz. laxator tympani, externus mallei, internus mallei, tensor tympani, stapedius ; 5. muscles of the nose, viz. compressor narium, elevator alæ nasi, depressor alæ nasi, cartilages of the nose ; 6. muscles of the mouth, lips, chin, and cheeks, viz. sphincter oris, elevator labii superioris, depressor labii superioris vel nasalis, elevator labii inferioris, depressor labii inferioris, elevator anguli oris, depressor anguli oris, elevator menti, zygomaticus, buccinator, platysma myoides, biventer, temporalis, masseter, pterygoideus internus, pterygoideus externus ; 7. muscles of the palate, viz. pterygo-staphylinus externus, thyro-staphylinus, glosso-staphylinus ; 8. muscles of the os hyoides, viz. genio hyoideus, sterno-hyoideus, mylo-hyoideus ; 9. the muscles of the tongue, viz. genio-glossus, basio-glossus, cerato-glossus, stylo-glossus, chondro-glossus, lingualis, the tongue itself ; 10. muscles which move the head on the trunk, viz. rectus internus major, rectus internus minor, rectus major posticus, rectus minor posticus, rectus lateralis, obliquus inferior, obliquus superior.

Q. Which is the occipito frontalis ?

A. The occipito-frontalis is a muscle with four fleshy bellies ; it arises behind each ear from the

the os occipitis; and soon becoming tendinous, passes under the hairy scalp to the forehead, where it becomes broad and fleshy, adhering to the skin, and is inserted into the upper part of the orbicularis palpebrarum, into the os frontis near the nose, and by two processes into the bones of the nose. When this muscle acts from the back part, it pulls the skin of the forehead upward, wrinkling transversely, and, in some persons, the hairy scalp backwards; but when the fore-part of it acts, it draws the skin with the eye-brows downward, and towards the nose when we frown.

Q. Which is the orbicularis palpebrarum?

A. The orbicularis palpebrarum surrounds the eye-lids; it arises from the upper apophysis of the maxillary bone. It is inserted into the nasal process of the superior maxillary bone, covering the anterior and upper part of the lachrymal sac. It shuts the eye-lids, serves to depress and draw forward the eye-brow at the same time, and elevates the lower eye-lids.

Q. Which is the corrugator supercilii?

A. The corrugator supercilii is so conjoined with the orbicularis palpebrarum, that it may be reckoned a part of it.

Q. Which is the ciliaris?

A. The ciliaris is also a very small portion of the orbicularis, next the ciliary cartilages of the eye-lids.

Q. What are the tarfi?

A. The tarfi are thin cartilages, forming the principal part of the edge of each eye-lid; their ends connected by a kind of small ligaments.

Q. What

Q. What are the ligamenta tarforum lata ?

A. The broad ligaments of the tarfi are situated along both edges of each orbit, the superior broader than the inferior, fixed to the edges of the cartilages, so that these ligaments and the tarfi alone, represent the eye-lids.

Q. Which is the elevator palpebræ ?

A. The elevator palpebræ superioris is a very thin muscle, which arises from the periosteum at the bottom of the orbit of the eye, where the optic nerve goes through the cranium, and is inserted into the whole ciliary cartilage of the upper eye-lid by a very thin, broad tendon.

Q. What are the muscles of the globe of the eye ?

A. Four strait, viz. the elevator, depressor, adductor, and abductor ; and two oblique, the superior and inferior.

Q. Which is the elevator oculi ?

A. The rectus attollens, vel elevator oculi, lies on the upper part of the globe, pulling up the ball of the eye when we look up : it arises from the upper part of the foramen opticum of the sphenoid bone below the elevator palpebræ superioris, and is inserted in the upper and fore part of the tunica sclerotis, near the cornea.

Q. Which is the depressor oculi ?

A. The rectus deprimens, vel depressor oculi, pulls down the eye : it arises, and is inserted directly opposite to the elevator oculi.

Q. Which is the adductor oculi ?

A. The rectus adducens, vel adductor oculi, draws the eye towards the nose ; it arises from the bottom of the orbit, near the optic nerve internally,

ternally, and is inserted into the tunica sclerotis on the side next the nose.

A. Which is the abductor oculi.

A. The rectus abducens, vel abductor oculi, draws the eye towards the little canthus, and hath both its origin and insertion directly opposite to the adductor. These four strait muscles terminate about the cornea by four short, thin, flat tendons; when they all act together they draw the eye toward the bottom of the orbit.

Q. Which is the obliquus inferior?

A. The obliquus inferior arises from the lower side of the orbit, near its external edge, where the bones of the os maxilla superioris join together: it ascends obliquely over the depressor, and is inserted behind the tendon of the abductor; it draws the globe of the eye forward, and turns it upward.

Q. Which is the obliquus superior?

A. The obliquus superior, vel trochlearis, arises from the bottom of the orbit, between the elevator and adductor oculi, and runs obliquely towards the great canthus. In the upper and inner parts of the orbit, near its edge, there is a cartilaginous ring or pulley, through which this muscle passes in a round tendon, and is inserted near the bottom of the globe of the eye, which it pulls upward and inward, and thereby directs the pupil outward and downward.

Q. Which are the muscles of the external ear?

A. Besides the cartilage and ligament of the ear, there is the elevator, anterior, and retractor auriculæ, the helix major and minor, the tragus, antitragicus, and the transversus auriculæ:

culæ; but all these muscles are extremely small, and often scarce discernible without the help of a microscope.

Q. What are the cartilage and ligament of the external ear?

A. The cartilage makes the greatest part of the external ear, it being the basis of all the other parts, of which this portion of the ear is made up. It is fixed to the cranium, not only by the cartilaginous portion of the meatus auditorius (which I shall describe hereafter) but also by two ligaments, one anterior, and the other posterior, opposite to one another.

Q. Which is the elevator auriculæ?

A. The attollens vel elevator auriculæ, has a very thin, tendinous origin from the tendon of the occipito frontalis, and is inserted into the back of the cartilage of the external ear.

Q. Which is the anterior auriculæ?

A. The anterior auriculæ is inserted into the back of that part of the helix which divides the concha.

Q. Which is the retractor vel retrahens auriculæ?

The retractor auriculæ arises by one, two or three small portions from the temporal bone, above the mastoid process: the upper and middle portion is inserted into the lower part of the back of the upper cavity of the external ear; and the lower portion is inserted into the back of the lower cavity. This muscle pulls the ear backward.

Q. Which is the helix major?

A. The

A. The helix major arises from the upper part of the outer side of the acute process of the helix; and is either inserted into the helix, or else runs along the surface of the elevator.

Q. Which is the helix minor?

A. The helix minor ascends near the helix on the fore-part of the outer ear; one end is fixed below the notch of the concha, the other above it.

Q. Which is the tragus?

A. The tragus arises from the cartilage of the concha near the tragus, and terminates in the upper part of the tragus, and adjacent part of the concha.

Q. Which is the antitragus?

A. The antitragus arises from the outer part of the cartilage of the antitragus, and is inserted into the edge of the concha behind the antitragus, at the bottom of the helix.

Q. Which is the transversus auriculæ?

A. The transversus auriculæ is divided into two parts: that belonging to the antihelix is inserted into the back of the antihelix, and a small part of it into the back of the scapha; that belonging to the scapha is divided into several parts for a considerable length; it arises from the back of the superior cavity of the concha, and is inserted into the back of the scapha.

Q. Which are the muscles of the internal ear?

A. The muscles of the internal ear are, the laxator tympani, externus mallei, internus mallei, tensor tympani, and stapedius.

Q. Which

Q. Which is the laxator tympani ?

A. The laxator tympani arises by a small beginning from the extremities of the spinous process of the sphenoid bone, behind the entry of the artery of the durā mater; then running backwards and a little upwards, along with the nerve called chorda tympani, in a fissure of the os temporis, near the fossa that lodges the condyle of the lower jaw. It is inserted into the long process of the malleus, within the tympanum, where it rests upon the edge of the fissure, between the pars squamosa and petrosa.

Q. Which is the externus mallei ?

A. The externus mallei arises from a process of the sphenoidal bone, between the os squamosum and petrosum, and is inserted into the whole length of the bony channel, which contains the auditory passage.

Q. Which is the internus mallei ?

A. The internus mallei lies along the inside of the Eustachian tube, fixed in the apophysis petrosa.

Q. Which is the tensor tympani ?

A. The tensor tympani arises from the upper part of the Eustachian tube, where it looks towards the basis of the skull, and is of a cartilaginous nature: its tendon is inserted into the handle of the malleus.

Q. Which is the stapedius ?

A. The stapedius is situated within the small bony pyramid at the bottom of the tympanum; its tendon goes through a small hole in the apex of the pyramid, and is inserted into the back part of the head of the stapes.

Q. What

Q. What are the muscles of the nose?

A. Two compressors, two elevators, and two depressors, besides the cartilages.

Q. Which are the compressor narium?

A. The compressor narium arises on each side from the outer part of the root of the wings of the nose, goes over the back of the anterior part of the nose, and are inserted in the moveable cartilage which forms the ala of the nares.

Q. Which are the elevator alæ nasi?

A. The elevator alæ nasi et elevator labii superioris, has its origin from the nasal process of the upper jaw bone on each side near the greater canthus of the eye: the extremities which run through the upper lip, and are inserted in the moveable cartilage, insert fibres as they pass into the upper part of the wings of the nose near the cheek.

Q. Which are the depressor alæ nasi?

A. The depressor alæ nasi arises on each side from the upper jaw bone, where the gums cover the sockets of the dentes incisores and canini: it is inserted round the root of each wing of the nose, and under, or within each nostril from the septum nasi, where that joins with the lip to the wing of the nose.

Q. What are the cartilages of the nose?

A. The inferior portion of the external nose is composed of several cartilages, which are commonly five; the rest are uncertain. The middle cartilage is the most considerable, and supports the rest, being connected immediately to the bony parts; the other four are connected

connected to the middle cartilage, and to each other by means of ligaments.

Q. What are the muscles of the mouth, lips, chin, and cheeks?

A. These are, the sphincter oris, elevator labii superioris, depressor labii superioris vel nasalis, elevator labii inferioris, depressor labii inferioris, elevator anguli oris, depressor anguli oris, elevator menti, zygomaticus, buccinator, platysma myoides, biventer, temporalis, masseter, pterygoideus internus and externus.

Q. Which is the sphincter oris?

A. Orbicularis, but more properly sphincter vel constrictor oris, surrounds the whole mouth about three-fourths of an inch broad. This muscle is very much intermixed with all the muscles that are inserted into it.

Q. Which is the elevator labii superioris proprius?

A. The elevator labii superioris proprius, arises from the bones of the upper jaw under the anterior and inferior part of the orbicularis palpebrarum, and also from the os malæ, and is inserted into the upper part of the sphincter oris. This raises the upper lip, and helps to dilate the nostrils.

Q. Which is the depressor labii superioris proprius?

A. The depressor labii superioris proprius, is a small muscle arising from the upper jaw, near the dentes incisores, and is inserted into the upper part of the lip, and root of the cartilages of the nose; hence it is also a depressor of the nose, which action constricts the nostrils.

Q. Which

Q. Which is the elevator labii inferioris proprius?

A. The elevator labii inferioris proprius, arises from the lower jaw, near the dentes incisores, and is inserted into the lower part of the under lip.

Q. Which is the depressor labii inferioris proprius?

A. The depressor labii inferioris proprius, arises broad from the lower jaw at the chin, and is soon inserted into the sphincter oris.

Q. Which is the elevator anguli oris?

A. The elevator anguli oris vel labiorum communis, arises from the superior maxilla under the middle of the orbit, and is inserted into the sphincter muscle near the corner of the mouth.

Q. Which is the depressor anguli oris?

A. The depressor anguli oris vel labiorum communis, arises laterally from the lower jaw near the chin, and is inserted into the sphincter opposite to the elevator anguli oris.

Q. Which is the elevator menti?

A. The elevator menti arises from the forepart of the lower jaw, from the socket of the lateral incisive tooth, extending to the socket of the next tooth on each side.

Q. Which is the zygomaticus?

A. The zygomaticus is a muscle arising from the os zygoma, or malæ, and is inserted into the sphincter at the corner of the mouth, which it draws outward and upward.

Q. Which is the buccinator?

A. The

A. The buccinator ariseth broad and fleshy from the fore-part of the processus coronæ of the lower jaw-bone, and adhering to the gums of both jaws, is inserted into the sphincter at the angle of the lips; it brings the food between the teeth in mastication, forces the breath out of the mouth in blowing, &c. and pulls the lips or corner of the mouth outward. Steno's salival duct perforates this muscle in the middle.

Q. Which is the platysma myoides?

A. The platysma myoides, vel latissimus colli, is a broad, membranous muscle, exceeding thin, and lies immediately under the skin; it arises from the pectoral muscle below the clavicle, and from part of the deltoide muscle; it runs obliquely forward, covering all the neck, rendering the unequal surface of the muscles even, and is inserted into the chin and depressor muscles of the lip. When it acts, it pulls down the corner of the mouth and the lower jaw: a convulsion herein is called the cynic spasm.

Q. Which is the biventer?

A. The biventer, or digastricus, arises with a fleshy belly from the upper part of the mastoid process; and descending, it contracts into a round tendon, which passes through the stylo hyoideus, and an annular ligament, which is fastened to the os hyoides; then growing fleshy again, it ascends towards the middle of the edge of the anterior part of the lower jaw, where it is inserted internally; when it acts, it pulls the lower jaw down by means of this trochlea, or pulley,

pulley, and serves to draw up the os hyoides, and parts annexed to it, in deglutition, as well as to prevent the action of several muscles which are concerned in swallowing; for which reason we cannot swallow at the same time that we open our mouth.

Q. Which is the temporalis?

A. The temporalis arises from part of the os frontis, parietale, sphenoides, malæ and temporale; from whence going under the two processes of the zygoma, it is inserted externally into the processus coronalis of the lower jaw, which it pulls upward: this muscle is covered with a strong tendinous fascia.

Q. Which is the masseter?

A. The masseter is a thick, fleshy muscle, situated at the back part of the cheek; it arises from the interior part of the os malæ and the zygomatic process, which joins this from the temporal bones: it is inserted into the angle of the lower jaw, which it pulls upward and forward: over this muscle passes Steno's salivary duct.

Q. Which is the pterygoideus internus?

A. The pterygoideus internus arises from the pterygoide process, and is inserted internally into the angle of the lower jaw, which it pulls upward.

Q. Which is the pterygoideus externus?

A. The pterygoideus externus arises from the os maxillare and os sphenoides, and is inserted internally into the condyloide process of the lower jaw, which it pulls to one side, and for-

wards, or, acting with its partner; pulls the jaw directly forward.

Q. Which are the muscles of the palate?

A. The muscles of the palate are the pterygo-staphylinus internus and externus, thyro-staphylinus, and glosso-staphylinus.

Q. Which is the pterygo-staphylinus internus?

A. The pterygo-staphylinus internus arises from the os sphenoides, near the tuba Eustachiana, and is inserted into the uvula, which it pulls up while we breathe through the mouth, or swallow.

Q. Which is the pterygo-staphylinus externus?

A. The pterygo-staphylinus externus, arises by the side of the last mentioned muscle, and is also inserted near it; but becomes its antagonist by being reflected on a pulley over a process at the lower part of the pterygoid processes of the sphenoidal bone.

Q. Which is the thyro-staphylinus?

A. The thyro-staphylinus arises from the lateral part of the thyroide cartilage; and ascending towards the uvula, is inserted in the manner of an arch in the side of the velum palatinum.

Q. Which is the glosso-staphylinus?

A. The glosso-staphylinus passes from the tongue to the palate, which it pulls down when we breathe through the nose. The palate itself is a sort of double muscle, whose action seems only to support itself, and assist those muscles which pull it upwards.

Q. What are the muscles of the os hyoides?

A. The

A. The os hyoides is moved by five pair of muscles, viz. the geniohyoideus, sternohyoideus, mylohyoideus, coracohyoideus, and stylohyoideus.

Q. What is the geniohyoideus ?

A. The geniohyoideus arises from the fore-part of the lower jaw internally, and is inserted into the basis of the os hyoides, which it pulls upward and forward.

Q. Which is the sternohyoideus ?

A. It is an antagonist to the last-mentioned muscle, and arises from the inside of the under part of the clavicle near the sternum ; and ascending above the geniohyoides, is inserted into the basis of the os hyoides, which it pulls downward.

Q. Which is the mylohyoideus ?

A. The mylohyoideus arises from the inside of the bottom of the lower jaw, under the dentes molares, and is inserted into the basis of the os hyoides. Its common use is to move the os hyoides, tongue, and larynx, both upwards, inwards, and sideways ; and when it is at rest, it has a farther use, viz. to compress the glands under the tongue, and by this means promote the discharge of the saliva into the mouth from the lower salival ducts ; whence it is we use this muscle when we want saliva in the mouth.

Q. Which is the coracohyoideus ?

A. The coracohyoideus is an antagonist to the last-mentioned muscle, and arises from the upper edge of the scapula ; and passing obliquely under the mastoideus, is inserted into the basis of the os hyoides, and draws it obliquely downwards.

Q. Which is the stylohyoideus?

A. The stylohyoideus arises from the styloide process, and is inserted in the horn and base of the os hyoides, which it pulls upward and backward. This muscle is often perforated about the middle, by the tendon of the digastric muscle of the lower jaw.

Q. What are the muscles of the tongue, besides those of the os hyoides, already mentioned?

A. The muscles of the tongue (besides those of the os hyoides already mentioned) are, genioglossus, basioglossus, ceratoglossus, styloglossus, chondroglossus, lingualis, and the tongue itself.

Q. Which is the genioglossus?

A. The genioglossus arises from the fore part of the lower jaw internally, and is inserted broad into the under part of the root of the tongue. When this muscle and its fellow act, they pull the tongue forwards, and thrust it out of the mouth.

Q. Which is the basioglossus?

A. The basioglossus arises from the basis of the os hyoides, and is inserted into the tongue near its apex or tip. Its use (with the assistance of the ceratoglossus) is to draw the tongue backward, and make it shorter.

Q. Which is the ceratoglossus?

A. The ceratoglossus arises from the horn of the os hyoides; whence it has its name. It is inserted laterally into the tongue, near its root, and draws the tongue obliquely on one side; but if both act at once, the tongue is pulled directly backwards into the mouth.

Q. Which

Q. Which is the styloglossus ?

A. The styloglossus arises from the apex of the styloide process, and is inserted into the root of the tongue, which it moves upward and backward.

Q. Which is the chondroglossus ?

A. The chondroglossus arises from the cartilaginous process of the os hyoides, meeting in the basis of the tongue, where they are inserted, but this pair is not found in all subjects.

Q. Which is the lingualis ?

A. The lingualis arises pretty large and fleshy from the basis of the tongue laterally, and runs straight forwards to its apex or tip. Its use is to contract or narrow the substance of the tongue, and at the same time to bring it backwards and downwards.

Q. What is the tongue itself ?

A. The tongue itself is a muscle made up of fibres longitudinal, circular, and transverse. This is the interior part of the tongue ; those I have before mentioned form the exterior part of the tongue, being inserted in it, and forming one body.

Q. What are the muscles which move the head on the trunk ?

A. The muscles which move the head on the trunk are the rectus internus major and minor, the rectus posticus major and minor, rectus lateralis, and the obliquus inferior and superior.

Q. Which is the rectus internus major ?

A. The rectus capitis internus major anticus, arises from the anterior part of the transverse apophyses of the five lower vertebræ of the neck,

and passing over the two superior vertebræ is inserted into the os occipitis. This muscle bends the head forward on the first and second vertebræ of the neck.

Q. Which is the *rectus internus minor*?

A. The *rectus capitis internus minor anticus*, arises from the anterior surface of the atlas or first vertebra of the neck; it is inserted into the os occipitis. This muscle also moves the head forward on the first vertebra.

Q. Which is the *rectus major posticus*?

A. The *rectus capitis major posticus*, is one of the extensors of the head, which arises from the spinal apophysis of the second vertebra of the neck, and is inserted into the lower part of the os occipitis. It pulls the head back on the first and second vertebra.

Q. Which is the *rectus minor posticus*?

A. The *rectus capitis minor posticus* is also an extensor of the head, having its rise from the posterior part of the atlas, and is also inserted in the os occipitis, to pull the head back on the atlas or first vertebra.

Q. Which is the *rectus lateralis*?

A. The *rectus lateralis* arises from the anterior part of the transverse process of the atlas; and is inserted partly into the occipitis, and partly into the os temporis. This turns the head on one side.

Q. Which is the *rectus capitis obliquus inferior*?

A. The *obliquus capitis inferior* five major, arises from the spinal apophysis of the second vertebra of the neck, and is inserted into the transverse

transverse apophysis of the first vertebra. When this acts, it turns the head with the atlas in a rotatory manner on the second vertebra.

Q. Which is the rectus capitis obliquus superior ?

A. The obliquus capitis superior five minor, arises from the end of the transverse apophysis of the atlas, and is inserted into the os occipitis, and back part of the os temporis. When but one of these acts, it assists the rectus lateralis on the same side ; but when they act both together they pull the head back.

Q. What is contained in the head, or what is the viscera of the head ?

A. The parts contained in the cranium are the brain.

Q. What is the brain ?

A. The brain is a soft white mass, in which all the organs of sense terminate, and the soul is supposed to reside. The brain is surrounded by two membranes called meninges and matres ; these are the dura mater, and the pia mater ; some make the external lamina of the latter to be a distinct membrane called arachnoides. The general mass is divided into three particular portions, viz. the cerebrum, or brain, properly so called ; the cerebellum ; and the medulla oblongata. And some add a fourth, viz. the medulla spinalis ; which is a continuation of the medulla oblongata, and fills the great canal of the spina dorsi.

Q. What is the cerebrum ?

A. The cerebrum or brain, properly so called, is a kind of medullary mass, of a greyish colour

colour on its outer surface, filling all the cavity of the upper and fore part of the cranium, which lies above the transverse septum. The upper part is of an oval figure, like half an egg cut lengthways, or rather like two quarters of an egg, and parted a little from each other : it is flatter on the lower part ; each lateral half of which is divided into three eminences called lobes ; one anterior, one middle, and one posterior. The human brain is three times as much in quantity as the brain of an ox ; it being in general about four pounds weight. The substance of the cerebrum is of two kinds. The exterior or cortical part, and the interior or medullary part. The former is about a sixth of an inch in thickness, softish, and of a greyish or ash colour ; the latter is more solid, and very white, and terminates in the beginning of the nerves. Besides the lobes I have already mentioned, the upper side of the cerebrum is divided into two hemispheres by the processus falciniformis of the dura mater ; and its lower side into four lobes ; two anterior and two posterior, the latter much the largest. At the meeting of the four lobes appears the infundibulum, which is a kind of lymphatic running from the ventricles of the brain, piercing the dura mater upon the basis of the skull ; and sinks into the substance of the glandula pituitaria ; which gland is seated in the sella Turcica. Between the two hemispheres in the corpus callosum, a hard white substance. The ventricles of the brain are cavities lined with a fine smooth membrane, from the pia mater. They are four in number, and
all

all communicate with one another. The two called anterior, lateral, or superior are very extensive; the other two, called the third and fourth, are very small in comparison with these. The lateral ventricles are divided by an extreme thin membrane or partition, called septum lucidum, under which is the fornix the hinder part of which divides into two parts called the crura fornicis or pedes hypocampi. In the basis of the lateral ventricles are eight prominences; two anterior, called corpora striata, from their ash colour lines; and the two thalami nervorum opti-
corum, so named because these nerves arise chiefly from them. The other four are small; two anterior called nates cerebri, and two posterior called testes cerebri. Upon the beginning of the thalami nervorum opti-
corum, are situated a number of blood vessels, glands, and lymphæducts, called plexus choroides. Under the beginning of the fornix is a foramen called iter ad infundibulum; and under its middle, one called foramen posterius, which is covered with a valve named membra vel valvula magna cerebri.

Q. What is the cerebellum?

A. The cerebellum lies under the posterior lobes of the cerebrum or brain, in the lower part of the cavity of the cranium; its figure is nearly globular, its superficies is not so circumvoluted and winding as that of the cerebrum, but furrowed, depressed, and largest in the middle, terminating in the vermiform process. The substance of the cerebellum is much the same as that of the cerebrum, only its cortical part is
more

more in quantity than the medullary; the latter is elegantly branched out like shrubs or little trees, the trunks of which are the basis of the cerebellum, and are what are called its peduncles, the lobules of the cerebellum adhere in clusters to the arbusculi medullares, are surrounded by the pia mater, and compose the far greater part of the cerebellum.

Q. What is the medulla oblongata?

A. The medulla oblongata is a medullary continuation of the medullary part of the cerebrum and cerebellum, formed into a kind of tail, and extended to the great foramen in the os occipitis, where it gives origin to the medulla spinalis, and to the nerves of the brain, where it divides, or appears like two bodies, is called crura medullæ oblongatæ; its union, isthmus, and the eminence beyond it processus annularis. The medulla oblongata is a third general part of the encephalon or whole mass of the brain, cerebrum, and cerebellum.

Q. What is the medulla spinalis?

A. The medulla spinalis is a continuation of the medulla oblongata, through the great foramen of the skull, and through the bony canal of the spina dorfi, to the extremity of the os sacrum; its thickness in general is nearly equal to that of a finger; but it is not uniformly of the same size throughout. The lower part in the os sacrum is called cauda equina from its resemblance. Its substance is nearly the same as that of the medulla oblongata, but somewhat tougher and more firm; the medullary substance is here outwardly, that the nerves may easily make their way

way out, and the cortical like part inwardly. To cover the medulla spinalis, next the bony canal of the spine internally, is a very strong tunica, which connects the vertebræ within; then the cellular or adipose coat, (which containing more or less fat, seems destined by nature to soften the former) and the dura and pia mater (which I shall by and by describe.) The dura mater, in its anterior part, is firmly connected with the vertebræ, but its posterior part is loose and fluctuating; the pia mater surrounds every part of the medulla spinalis, and all the nerves that arise from it, and enters also its longitudinal division. The arteries and veins of the medulla spinalis enter at the apertures of the vertebræ, which give passage out to the nerves, and come from the vertebals of the neck, intercostals, and the lumbar. The nerves of the spine are thirty-two pairs, arising from the medulla, connected by and covered with membranes; the use of the spinal marrow is to give origin to these nerves, which are principally distributed to the limbs and external parts, and to secrete and prepare a nervous fluid.

Q. What are the coverings of the brain, viz. the cerebrum, cerebellum, and medulla oblongata?

A. Two membranes named dura mater and pia mater, the latter is the innermost; the former is the external membrane, which covers the whole.

Q. What is the pia mater?

A. The pia mater is a thin and exceeding fine double membrane, which immediately and firmly involves

involves the brain closely, sinks into all its cavities and furrows; its outer membrane is by some made a distinct coat, and called arachnoides. The pia mater covers also the medulla spinalis, and its membranes adhere very closely and firmly to one another in the upper part of the head, but much less so with the dura mater. The two laminae of the pia mater are not so closely united as those of the dura mater, being connected only by a cellular substance, which accompanies them through their whole extent, except at some places of the basis of the cerebrum, &c. where the internal lamina continuing its insertions, the external remains uniformly detached over the prominent parts, the interstices of which are entirely separated from the other lamina without any cellular substance betwixt them. The use of this membrane is to contain the brain, and support the blood vessels, which run here in great number, with a multiplicity of turnings and windings, that the blood may not enter the brain too impetuously, and for the veins to unite on, that they may enter the sinuses in fewer and larger branches. In short, it seems in a manner wholly composed of blood vessels; whose distribution through all its furrows and anfractuosities serves also to secrete proper fluids in the brain, and to form the animal spirits. The arteries are from the internal carotids and vertebrals: some of the veins discharge themselves into the sinuses of the dura mater, and others immediately into the jugular and vertebral veins.

Q. What

Q. What is the dura mater ?

A. The dura mater is a very compact, strong, thick membrane, covering the pia mater ; it lines the inside of the cranium, and supplies the place of an internal periosteum, firmly adhering to its basis, and but lightly at the upper part, except at the futures ; it is spread in all the holes and depressions, and covers all the eminences of the skull, to prevent their being hurtful to the brain. It has three processes ; the first, named falx, begins at the crista galli, and runs backwards under the futura sagittalis to the cerebellum, dividing the cerebrum into two hemispheres : its use seems to be to divide the brain so as to render it less liable to be moved in the skull, by any violent motions of the head ; and the under side of the brain is kept steady by the inequalities of the basis of the skull which the brain is exactly fitted to. The second process runs from the former to the os petrosum, and prevents the cerebrum from pressing on the cerebellum : from this runs a third process, and both serve also to keep the brain steady. The dura mater receives arteries from the carotids, beautifully ramified like shrubs. Its veins are of two kinds ; some as in other parts of the body, and others of a triangular figure, called sinuses, the latter give warmth to the brain. It has nerves for sensation from the fifth and eighth pair of the brain. The dura mater has a motion, said to be peculiar to itself, and of a muscular kind ; but it is much more natural to suppose it owing to the pulsations of the arteries of
the

the brain. There are also a number of small glands in the sinuses and sides of the dura mater, and between it and the pia mater, described by Pachonius, and seem destined for the secreting of a fluid to moisten the dura mater.

Q. What are the arteries of the brain ?

A. The arteries that supply the cerebrum, cerebellum, and medulla oblongata come partly from the carotids, which enter the cranium thro' the canals in the apophysis petrosæ, and partly from the vertebrals which enter by the occipital foramen. I shall be more particular when I speak of the arteries of the head.

Q. What are the veins of the brain ?

A. The veins of the brain are branches of the sinuses of the dura mater, already mentioned : their principal ramifications accompany all the cortical circumvolutions of the cerebrum, and directions of the strata of the cerebellum, running always in the duplicature of the pia mater : the veins of the plexus choroides in general, are of the number of these abovementioned, of which I shall be more particular hereafter.

Q. What are the nerves of the brain ?

A. In the lower part of the medulla oblongata, are distinguished the nerves of the brain, which are commonly said to be ten pair, though in reality only nine, as follows in Latin verses :

Olfaciens, cernens, oculosque movens, patiensque,
Gustans, abducens, audiensque, vagansque, lo-
quensque.

I shall

I shall also be more particular when I come to mention the nerves of the head hereafter.

Q. What is the glandula pinealis ?

A. The glandula pinealis is a small gland, situated behind the thalami nervorum optico-rum, in the third ventricle of the brain, adhering very closely to the plexus choroides, by which it is covered, called pinealis, from its resembling a pine apple, by its figure: It is the size of a pea. It seems to be mostly of a cortical substance, except near the foot stalks, where it is somewhat medullary. This gland hath been often found to contain gravel.

Q. What is the glandula pituitaria ?

A. The glandula pituitaria is a gland of the brain, about the bigness of a very large pea, partly greyish, partly reddish, and white within; it is seated in the sella of the os sphenoides called turcica, between the sphenoidal folds of the dura mater, and is covered by the pia mater, as by a bag, the opening of which is the extremity of the infundibulum, from which it receives a lymph or juice, which the infundibulum derives from the plexus choroides and pineal gland; from this lymph, the gland takes its name; it also filtrates a juice itself, separating from the blood a white liquor, very subtil, and apparently very spirituous.

Q. What are the arteries of the head ?

A. The arteries of the head, both external and internal, proceed from the carotids, cervicals, and vertebrales; and their branches are called by the names of the parts they are bestowed upon, as linguales, temporales, occipitales, &c.

The origin of the arteries of the head I shall speak of hereafter, in describing those of the neck and trunk.

I. *Arteria carotis externa*, or external carotid artery is anterior, and smaller than the internal carotid; its trunk runs up between the external carotid of the lower jaw, and the parotid gland, which it supplies as it passes; afterwards it ascends on the foreside of the ear, and ends in the temple. In this course it sends off five principal internal branches, and three principal external branches. The internal branches are, 1. *Sublingualis vel ranina*, to the muscles of the os hyoides, the tongue and glandulæ sublinguales. 2. *Maxillaris inferior*, to the maxillary, parotid, and sublingual glands, styloide and mastoide muscles, muscles of the pharynx, and to the small flexors of the head. 3. *Maxillaris externa*, to the masseter, middle of the lowest jaw, angles of the mouth, buccinator, and elevator menti, and a particular one to the sphincter oris, which forms a kind of coronaria labiorum, and from thence it goes to all parts of the nose, and, lastly, to the great angle of the eye, where it is ramified and lost on the musculus orbicularis palpebrarum, superciliaris, and frontalis, and is named *arteria angularis*. 4. *Maxillaris interna*, to the muscles of the palate, glandular membrane of the posterior nares, and to all the parts contained within the orbits of the eyes. A small branch then enters the cranium through the sphenoidal fissure, and is spent upon the dura mater; another small branch goes to the maxillary sinus and teeth; a principal

cipal branch runs through the canal of the lower jaw to the alveoli and teeth, and goes out at the hole near the chin to the neighbouring muscles; a third principal branch goes up between the external and internal carotid to the dura mater.

5. A principal branch goes to the masseter muscle. The external branches are, 1. Occipitalis to the muscles and integuments of the os occipitis, and a branch to the mastoide foramen. 2. A principal branch supplies both the external and internal ear. 3. The trunk of the external carotid runs up (as I have before observed) between the external angle of the lower jaw and parotid gland, which having supplied it, forms the temporal artery, which divides into an interior, middle, and posterior branch; the anterior to the musculus frontalis, and sometimes to the internal apophysis of the os malæ all the way to the orbits; the middle one to the musculus frontalis and occipitalis; and the posterior to the occiput. All these branches likewise furnish the integuments?

II. Arteria carotis interna, the internal carotid artery having passed the great canal of the apophysis petrosa of the os temporis, sends off a branch through the sphenoidal fissure to the orbit and eye, and soon after another through the foramen opticum, by which it communicates with the external carotid. It then runs under the basis of the brain to the side of the infundibulum, where it commonly divides into two branches; the anterior branch runs forward under the brain, and after sending off small arteries to the olfactory nerves, it divides

into two or three branches; the first of these branches goes to the anterior lobe of the brain; the second to the corpus callosum, falx of the dura mater, and middle lobe of the brain; the third to the posterior lobe of the brain: the posterior branch, after communicating with the vertebral artery, is ramified on, and between the superficial circumvolutions of the brain all the way to the bottom of the sulci. All these ramifications are covered by the pia mater, in the duplicate of which they are distributed, and form capillary reticular textures in great numbers; and afterwards they are lost in the inner substance of the brain. From these minute divisions of the arteries in the pia mater before they enter the brain, it would seem as if the pulse of larger arteries would make too violent an impression on so tender and delicate a part: and, perhaps, it may be from an increase of the impulse of the arteries in the brain, which strong liquors produce, that the nerves are so much interrupted in their functions throughout the whole body, when a man is intoxicated with drinking; and may it not also be from a like cause that men are delirious in fevers.

III. *Arteriæ cervicales*, arise from the subclavian arteries (I shall hereafter describe) and ascend to the head through the foramina, in the transverse processes of the cervical vertebræ, and into the skull through the tenth or great foramen, and pierce the dura mater; these two arteries uniting soon after their entrance, give off branches to the cerebellum, and then passing forward, divide and communicate with the carotids;

rotids; and the carotid arteries communicating with each other, there is an entire communication between them all. These cervical arteries Winslow calls arteriæ vertebrales.

Q. What are the veins of the head?

A. The veins of the head are the jugular and the cervical or vertebral veins. Their origin I shall mention hereafter. 1. Venæ jugulares externæ, or the external jugular veins, are sometimes double from their origins; and when they are single, each of them divides afterwards into two, one anterior, and the other posterior, or rather superior. The anterior branch is often a branch of the internal jugular, and sometimes arises from the communication of the two jugulars, and sometimes, but very rarely, from the vena axillaris. It runs upward to the lateral parts of the lower jaw, between the angle and the chin, and sends several branches forwards, backwards, and inwards; forwards to the maxillary glands, digastric muscle, muscles and integuments of the chin and under lip; backwards, it sends a small branch a little below the lower jaw, which communicates with the jugularis externa posterior; inwards to the glandulæ sublinguales, to the tongue, called venæ raninæ, to the muscles of the angles of the lips and neighbouring parts; also to the muscles of the palate, septum palati, amygdalæ, uvula, and to the membrane which lines the arch of the palate. The trunk of the anterior external jugular vein goes from the angle of the lower jaw to the internal angle of the orbit, sending branches on each side to the muscles and integuments of

the face, and takes the name of *vena angularis*. This trunk sends off branches to the upper lip, cartilages, and part of the nose, eye-lids, and forehead, which last is called *frontalis*; a branch also communicates with the sinuses of the *dura mater*, entering the orbit by the *orbital sinus* of the eye. The posterior branch or superior external jugular vein, runs up toward the parotid gland, and lower anterior part of the eye, giving out several considerable branches toward each side: at its origin a principal branch is sent out posteriorly, called *vena muscularis*, and a little higher up the *vena cervicalis*, (which I shall speak of hereafter) backward, it detaches the *vena occipitalis* to the occiput, and sends a small vein through the posterior mastoid hole, which terminates in one of the lateral sinuses of the *dura mater*. It then communicates with the anterior external jugular, under the angle of the lower jaw, and passes through the parotid gland, sometimes giving off several branches, which very soon unite together, and form *areolæ* or meshes, through which the nerves pass. Afterwards it passes before the ear, taking the name of *vena temporalis*, which is distributed to the temples and lateral parts of the head, towards the occiput and forehead, sending branches also to the temporal muscle, to the neighbouring parts of the upper jaw, and to the inside of the lower jaw. The branches of the external jugular all communicate with one another, and with the *jugularis interna*. 2. *Vena jugularis interna*, the internal jugular vein, is the largest of all those that go to the head (its
origin

origin I shall mention hereafter). This vein detaches a branch up toward the parotid gland, and angle of the lower jaw, where it sends off branches to the muscles of the os hyoides, and sometimes a branch called *vena maxillaris interna*. Another branch is sent backward to the occiput, communicating with a branch of the *vena vertebralis*, and with the lateral sinus of the *dura mater*. Most of these branches communicate with the external jugulars. 3. *Vena vertebralis*, the vertebral vein (whose origin I shall mention hereafter) proceeds to the foramen occipitale, and communicates with the occipital veins and occipital sinuses of the *dura mater*. This vein sends branches to the small interior muscles of the head, and sometimes, though not always, a branch communicates with the lateral sinus of the *dura mater*.

Q. What are the nerves of the head ?

A. The nerves of the head are ten pair proceeding from the encephalon as I have before observed, page 40.

Q. What are their names, from whence their origin, and how distributed ?

A. 1. The first pair are the *nervi olfactorii*, or olfactory nerves, which arise from the corpora striata of the brain, between the anterior and middle lobes ; they go out through the foramina of the os cribriforme, and are immediately spread on the membrane which covers the os spongiosum, and lines all the internal parts of the nose ; they communicate with the *nervi optalmici* and *maxillaris superior*. These nerves are the immediate instruments of smell.

ling. 2. The second pair are the *nervi optici* or optic nerves, which arise from the eminences of the cerebrum, called *thalami nervorum optictorum*; they pass out through their proper hole in the sphenoid bone, and enter the globe of the eye, to be expanded upon the *membrana retini*. The blood vessels running through the middle of these nerves, and the ramifications of the retina, are very serviceable, whence we may deduce the reason of Picard's experiments of such objects as fall on the entry of the optic nerve being lost to us; and hence also an account may be given of an *amaurosis*, or *gutta serena*. 3. The third pair are the *nervi motores oculorum*, which arise at the anterior part of the *processus annularis*, and going out at the *foramen lacerum*, are distributed to the globe of the eye and its muscles. 4. The fourth pair, are the *nervi pathetici*, and are the smallest of any; they arise from the anterior lateral part of the *processus annularis* of the *medulla oblongata*, go out at the *foramina lacera*, and are entirely spent on the *musculi obliqui superiores oculorum vel trochleares*; and as those muscles act in ogling, staring, &c. their nerves are named *pathetici*. 5. The fifth pair are the *nervi gustatorii vel trigemini*, and are the biggest of the brain; they arise from the sides of the annular process, giving nerves to the *dura mater*, then each divides into three branches; the first branches help to form the intercostal, and then goes to the orbit, (by the name of *orbitarius vel ophthalmicus*) lachrymal gland, fat, membranes, and palpebræ of the eye, mem-
brana

brana narium, the muscles and integuments of the forehead. Hence we easily discover what part is affected in the megrim (which is a disease causing great pain in the temple and forehead of the head) when the eye-ball and forehead are racked, and a heat is felt within the nose. Hence also we may learn how the muscles of respiration come to be so much affected on the application of any acrid irritating substance to the membrana narium, as to produce that violent convulsive motion sneezing. The second branch, or maxillaris superior, passes out through the round foramen of the sphenoid bone, and immediately gives nerves to the fat under the temporal muscle, palate, sinus sphenoidalis, and nostrils; the remaining trunk supplies the autrum Highmorianum (which is a cavity in the maxillary, or jaw bone) and teeth of the upper jaw, then comes out at the orbiter externus hole, and is spent on the musculus orbicularis palpebrarum, nose, and upper lip. The third branch, or maxillaris inferior, goes out at the fourth hole of the sphenoidal bone, and soon splitting into a great many branches, is distributed to the musculus temporalis, masseter, pterygoides, digastricus buccinator, mylohyoides, geno-hyoideus, genio-glossus, and basioglossus, glandula sublingualis, maxillaris inferior, and parotis, to the external ear, where it seems to join the portio dura to the substance of the tongue, in which it is pretty much confounded with the ninth pair; from the root of this last branch, the chorda tympani is reflected. The last ramification of
this

this branch, which I shall take notice of, is that which furnishes the teeth of the lower jaw, and comes out at the chin, and is distributed on that and the lower lip, and again united to the seventh pair. From this short account of the large fifth pair of nerves, and by observing several phænomena which happen to those parts to which they are distributed, we might have a much farther confirmation of the general doctrine of nerves delivered, and see, at least, the way pathed to a rational account of the phænomena, for reasoning on which we should not otherwise have the least ground. We can, for example, from the chorda tympani and the nerves of the teeth being derived from the same common trunk, understand how the sound of any vibrating body held between our teeth is sensible to us, when another person cannot possibly hear it; by the like rule, we know why in a violent tooth-ach, the muscles of the face are sometimes convulsed; nor shall be surprized to hear one plagued with the ach in his upper teeth, complain of a gnawing pain deep seated in the bones of his face, or to see his eyelids much swelled, or the tears trickling down in great abundance; whereas the lower teeth aching, the ear is pained, and the saliva flows in great quantity. We may have a distant view of some foundation in reason for the cure of the tooth-ach by strong compression of the chin, or by applying blisters behind the ears, or by burning behind or in the ear. Among a great many instances of the good effect of the actual cautery.

in

in such a case, I shall give one which seems to me remarkable: A man was seized with the tooth-ach, and a convulsion of that whole side of his face followed whenever the pain became acute, or he attempted to speak; after he had undergone bleeding, purging, salivation, setons, &c. without any benefit, he was cured by applying a small cauterising iron to the anti-helix.

6. The sixth pair of nerves are the *nervi abducentes*, which arise from the fore part of the *corpora pyramidalia* (which are two protuberances of the under part of the *cerebellum*, so called from their resemblance of a pyramid) and after piercing through the *dura mater*, they give off a branch, which joining with the reflected twig of the *opthalmic* branch, forms the original of the *intercostal* and passes through the *foramen lacerum*, to be spent entirely on the *musculus adductor oculi*. Supposing this nerve to supply ever so little less than a due proportion of *liquidum nervosum*, an involuntary *strabismus*, or squinting, will be occasioned. Though the fifth and sixth pair of nerves form entirely the beginning of the *intercostal* before it goes out of the skull; yet as several other nerves contribute towards the formation of its trunk, before it sends off any branches, I shall postpone the description of it till I have spoke of the original nerves.

7. The seventh pair are the *nervi auditorii*, which arise from the side of the root of the *processus annularis*, and entering the *meatus auditorius internus*, and immediately dividing, one part is expanded on the inmost camera of the ear, the other goes through the

the aquæductus Fallopii, and comes out of the skull between the styloide and mastoide processes, whence the reason of the one being named portio mollis, and the other dura. This last, after its exit, supplies the musculi obliqui capitis, stylohyoidei, styloglossi, stylopharyngæi, and platysma myoides, on which and to the skin of the neck, a great number of its small filaments run, which are sometimes cut in opening the jugular vein, whence follows pain at first, and a little numbness afterwards; the superior branches of this nerve supply the parotid gland, external ear, and the whole side of the face as far forward as the chin. It is said to communicate thrice with the fifth pair, and twice with the second vertebra. - May not we hence see some reason why the head is so soon removed by the impression of sound on our ear? 8. The eighth pair are the nervi sympathetici medii vel par vagum, which arise from the side of the basis of the corpora olivaria, (which are two protuberances, of the medulla oblongata, so called from their representing an olive in shape) runs to the hole common to the ossa temporum and occipitis, and are there joined by the accessorius Willisii, (which has its beginning from the two or three superior nerves of the medulla spinalis) mounts up and passes out with the par vagum at that common foramen just now mentioned, then separating the accessorius, goes through the musculus mastoideus, and is lost in the trapezius, and rhomboides scapulæ; while the larger trunk, (from the greater number of branches

branches it sends off, obtains the name of *vagus*,) runs strait down the neck near the carotid artery, and in its course gives several branches to the larynx; when entered the thorax, it splits into two, the anterior branch goes to the pericardium, and with those of the intercostal to the heart, then on the right side turns round the subclavian, and on the left round the ductus arteriosus, and goes up again at the side of the œsophagus to be lost in the larynx. This recurrent branch it is, that we are earnestly cautioned to avoid in bronchotomy, though by its deep situation we are in no hazard of hurting it: if both these nerves were cut, it is probable the voice would not be entirely lost, as long as the superior branches still supply the larynx. The posterior branch goes along with the œsophagus, and supplies the lungs, gula, and stomach very plentifully: and as all the nerves bestowed on the stomach enter at the superior orifice of it, the sensations here must be very acute; what remains of the *par vagum* is joined to the intercostal immediately below the diaphragm.

9. *Nervi hypoglossi externi vel par linguale*, which arise from between the corpora pyramidalia and the corpora olivaria, passing out of the skull through their proper holes of the *os occipitis*, and after supplying the *glandula thyroidea*, and *musculi sternohyoides*, and *sternothyroidei*, are lost in the substance of the tongue. Authors have disputed whether this ninth or the fifth is the gustatory nerve; the old opinion [in favour of the ninth] is to me most probable, because the fifth is no where else employed

ployed as an organ of sensation, and because the ninth seems to penetrate the substance of the tongue more, while the fifth is spent on the muscles. 10. The tenth pair are the *nervi suboccipitales*, which arise from the beginning of the *medulla spinalis*, betwixt the *os occipitis* and first *vertebra colli*; and are all, except what goes to the ganglion of the intercostal, spent on the *musculi obliqui* and *extensores capitis*. But these as before observed, page 39, are more properly the first pair of nerves of the neck.

The only nerves of the *encephalon* remaining now to be described are the reflected branches of the fifth and sixth pair, which are not easily traced, being so small and pappy, and hid by the carotid artery as they go out of it; but whenever they have escaped from the *os petrosum*, they are joined by branches from the eighth, ninth, and tenth pair, and the first and second spinal, whence the largest ganglion of the body is formed, from which the nerve named now intercostal goes out to descend down the neck with the carotid, supplying in its course the *musculi flexores* of the head and neck, and communicating with the cervical nerves; then as it is about to enter the thorax, it again forms a ganglion, from which the nerves to the *trachea arteria* and heart are supplied. The intercostal after this runs down on the side of the *vertebræ thoracis*, having additional nerves constantly sent to it from between these *vertebræ*, till it passes through its own proper hole of the *diaphragm*; whence it again forms another ganglion close by the *glandulæ renales*, into which
the

the eighth pair enter. From such a knot on each side, the nerves of the guts, liver spleen, pancreas, and kidney are derived; and from it the pelvis and its parts are also supplied. Hence the great sympathy of these parts may be easily deduced; and a reason may be given of a violent vomiting that commonly attends a nephritis, and of the belching, cholics, and stomach-achs, which often ensue, on the obstructions of the menstua.

Q. What are the glands of the head?

A. The glands of the head remaining now to be described, are in the exterior part that is out of the cavity of the skull; those of the interior part, viz. the glands of the brain and its membranes, have been already spoken of. Those now to mention, are the parotides, maxillares, sublinguales, tonsillæ, linguales, labiales buccales, fauciales palatinæ, gingivarum, and uvulares; which take their names from their respective situations, being situated in and about the mouth, palate, and tongue, to afford saliva in all parts of the mouth to keep it moist. Those more remote are chiefly concerned in mastication. In the orbit also there is the lachrymal glands; under the eye-lids are the ceraceous or sebaceous glands, the mucose glands of the pituitary membrane of the nostrils, and the ceruminose glands of the ears. The largest and most remarkable are the salival glands; the others are so small as to render a particular description unnecessary and of no significance.

Parotis, vel maxillaris superior, is the largest of the salivary glands; it is situate behind the
lower

lower jaw, under the ear, on each side; from this gland, there runs a very large duct, about three fingers breadth long, and of the thickness of a wheat straw, having a great number of roots; this duct, from Steno the discoverer, is called after his name, but by others ductus salivaris superior. It passes over the tendinous part of the masseter muscle, (to prevent its being compressed by that muscle, which would obstruct the saliva) through the middle of the cheek, and there perforates the buccinator muscle and the membrane of the mouth; near the second or third of the dentes molares, and at this perforation it discharges a very large quantity of its proper fluid into the mouth: When this duct is divided by an external wound, the saliva will flow out on the cheek, unless a convenient perforation be made into the mouth, and then the external wound may be healed. This gland is one of those that serve for the secretion of the saliva; it has the discharge of its saliva promoted by the motions of the lower jaw; when this gland is ulcerated, there is a constant effusion of saliva; to cure which Hildanus applied the actual cautery; but if you consume the greatest part of the gland with merc. præcip. rubr. it will heal with little trouble.

Maxillaris inferior is situate between the lower jaw and the tendon of the digastric muscles: its duct passes under the musculus mylohyoideus, and enters the mouth under the tongue, near the dentes incisarii.

The

The molares are two glands nearly of the same kind as the maxillares, each of them being situated between the masseter and buccinator. They send out small ducts which perforate the buccinator, and open into the cavity of the mouth, almost over against the last dentes molares, and from thence they trace their name.

Sublingualis is a small gland situated under the tongue, one on each side, between the jaw and the ceratoglossus muscle.

Tonsilla is a globular gland, about the bigness of a hazel nut, situate upon the pterygoideus internus muscle, between the root of the tongue and the uvula, on each side of the mouth, they are commonly called almonds of the ears, from their resembling almonds in figure. The tonsilla has no duct continued from it, but empties all its small ducts into a sinus of its own; which sinus, when the gland is inflamed, may easily be mistaken for an ulcer. This gland, with its fellow, directs the masticated aliment into the pharynx, and also serves for the uvula to shut down upon when we breathe through the nose. They are compressed by the tongue and the aliment, when the former raises the latter over its root, and thereby opportunely emits their saliva to lubricate the food for its easier descent through the pharynx. A schirrous tumour of either of these glands is a common disease, and it admits of no remedy but extirpation; the best way of doing which is by ligature. Pressure upon the surface of a gland very much promoting the secretion that is made in it, these glands are so seated as to be pressed

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by

by the lower jaw, and its muscles, which will be chiefly at the time when their fluid is wanted; and the force with which the jaw must be moved, being as the driness and hardness of the food, which is necessary; for all food, being to be reduced to a pulp, by being broke and mixed with saliva before it can be swallowed fit for digestion, the drier and harder foods needing more of this matter, will from this mechanism be supplied with more than moister foods, in about that proportion in which they are drier and harder; and the drier foods needing more saliva than the moister, is the reason why we can eat less, and digest less of these than those. What quantity of saliva these glands can separate from the blood in a given time will be hard to determine; but in eating of dry bread, it cannot be less than the weight of the bread; and many men, in a little time, can eat more dry bread than twice the size of these glands; and some that are not used to smoaking, can spit half a pint in smoaking one pipe of tobacco. Some men in a salivation have spit for days, or weeks together, a gallon in four and twenty hours; and yet all these glands put together do not weigh more than four ounces.

The *glandulæ sebaceæ* are situated in the interior surface of the eye-lids; they serve for the secretion of an oleaginous fluid, which prevents the attrition of the eye-lids from their continual motion.

The *glandula lachrymalis* is situated in the orbit, above the smaller angle, with its excretory ducts under the upper eye-lids.

The

The glandulæ ceruminosæ are small glands of a yellow colour, situate in the convex part of the membrane of the meatus auditorius of the ear, about the middle of the passage; they serve to secrete the cerumen, which they deposit for various purposes in the passage.

Glandulæ mucosæ are situated in the pituitary membrane of the nostrils, and separate that matter which we call mucus.

DIALOGUE III.

Of the NECK and its PARTS.

Q. WHAT are the parts of the neck?

A. The fore part of the neck is the throat and the back part of the nape. The neck consists of seven bones or vertebræ; a number of muscles which serve to move the head, neck, larynx, pharynx, and the os hyoideus; a number of very large arteries, as the internal and external carotids, and the vertebral ones; large veins, as the internal and external jugulars, and the vertebral veins; large nerves of the par vagum, intercostals, recurrents, diaphragmatics, and the vertebral; a part of the spinal marrow; the aspera arteria or trachea, particularly the larynx; the pharynx, with part of the œsophagus; and the thyroide, with the

other smaller glands. The bones of the neck are named vertebræ.

Q. What are the vertebræ?

A. The vertebræ or joints of the neck and back from the os occipitis to the os sacrum, are twenty-four in number, those of the neck belong also to the spine forming one bony column for the reception of the spinal marrow; each vertebra is distinguished into two parts, viz. the body and its processes. The body of each vertebræ, except the first, is softer and more spongy than the processes, which are harder and more solid; the fore part of the body is round and convex; the hinder part somewhat concave, its upper and lower parts are covered with a cartilage pretty thick forwards; but thin backwards, by which means we bend our body forwards; for the cartilages yield to the pressure of the bodies of the vertebræ, which in that motion come closer to one another. This could not be effected, if the harder bodies of the vertebræ were close to one another. Each vertebra has three sorts of processes, towards its hinder part, except the first: from the hind part of each stands a process named spinalis, and from every one a process on each side called transversalis, with one short one above it, and so below it named obliqui superiores et inferiores. By these short oblique processes the vertebræ are articulated; and in each of the transverse, there is a tendon of the vertebral muscles inserted. These processes, with the hinder or concave part of the body of the vertebræ, form a large hole in each vertebra, and all the
holes

holes answering one another (from the head to the os coccygis) make a channel for the descent of the spinal marrow, which sends out its nerves to the several parts of the body by pairs through two small lateral holes in each space, between the vertebræ formed by the joining of four notches in the side of each superior and inferior vertebræ. The vertebræ are articulated to one another by a ginglymus; for the two inferior oblique processes of all the vertebræ of the neck and back, have a little cavity-like in their extremities, wherein they receive the extremities of the two superior oblique processes of the inferior vertebræ next to it; so that the two superior processes of each vertebra of the neck and back are received, and the two inferior do receive, (except the first of the neck and last of the back) but the superior processes of each vertebra of the loins receive, and the two inferior are received, contrary to those of the neck and back. The vertebræ are all tied together by a hard membrane, made of strong and large fibres; it covers the body of all the vertebræ forwards, reaching from the first of the neck to the os sacrum. There is another membrane which lines the canal, made by the large hole of each vertebra, which also ties them all together; besides the bodies of the vertebræ are tied to one another by the intervening cartilages, and the tendons of the vertebral muscles which are inserted in their processes, as before mentioned, tie them together behind. From this account of the articulations of the vertebræ, it is evident their center of motion is altered in differ-

ent positions of the trunk. For when we bow forwards, the superior moved part bears entirely on the bodies of the vertebræ; if we bend back the oblique processes support the weight; if we recline to one side, we rest upon the oblique processes of that side, and part of the bodies of the vertebræ; if we stand erect, all the bodies and oblique processes have their share in our support. From this structure, the extensors have about twice the lever to act with, and consequently, twice the power to raise the trunk into an erect posture that they have to carry it beyond that posture; for then the oblique processes begin to be the centre of motion, and give a like advantage to the benders; without this contrivance it would be more difficult to keep the body erect, or to recover an erect posture with considerable strength after a bend of the body. If the spine had been composed all of one bone, we could have had no motion in our backs; or had it been of two or three bones, or fewer bones or joints than it really is, they must have either not been capable of bending so much as they do, (and been so pliable for the several postures we have occasion to put ourselves in) or have bent more in each joint, which would have pressed or bruised the spinal marrow; the ill consequences of which are sufficiently seen in persons grown crooked, or who have had distortions from external accidents. Again, if the spine had been made of several bones, without intervening cartilages, we should have had no more use of it, than if it had been but one bone; if each vertebra had had its own
distinct

distinct cartilage, it might have been easily dislocated; and, lastly, the oblique processes of each superior and inferior vertebra keep the middle one, that it can neither be thrust backwards nor forwards, to compress the medulla spinalis.

Q. What are the bones of the neck?

A. The bones of the neck are the seven superior vertebræ of the spine, (I have already mentioned); these vertebræ are smaller than those of the back, but they are of a firmer, harder consistence; their body is more compressed than in the others, and is situated on the other part, and convex below. The breadth on the fore part increases gradually as they descend; so that the vertebræ of the neck taken all together represent a sort of pyramid. The transverse processes of these vertebræ are perforated for the passage of the vertebral vessels to the head; and the acute or spinal processes are forked and strait; but besides this, the first and second vertebræ have something peculiar to themselves. The first, or upper vertebra is called Atlas (because it supports the head, as king Atlas did the globe of the universe, according to ancient fable;) it has neither body nor spinal process, for which reason its substance is more solid than that of any other; the foramen or hole in this, is greater than in any other vertebra, and it looks like an irregular bony ring. The upper side of this vertebra has two cavities, into which the apophyses of the os occipitis are received; but these two cavities together, unlike all other joints, are laterally por-

tions of concentric circles, by which means they are but as one joint, and so suffer the head to move easily sideways, which otherwise it could no more do than the knee, which also has two heads and two cavities. The under side of this bone has a very flat articulation with the next, which fits it for a rotatory motion. In the fore part of its great hole it has a pretty large sinus, in which lies the tooth-like process of the second vertebra, being fastened by a ligament that rises from each side of the sinus, that it compress not the medulla spinalis; it has two small sinuses in its upper part, in which the tenth pair of nerves and the vertebral arteries lie. The second vertebra is called *epistrophæus*, *dentata*, or *axis*, from a process which passes through the former bone, and is the axis upon which it turns; nevertheless, all the vertebræ of the neck contribute something to the rotatory motion of the head. The *processus dentatus*, which is long and round like a tooth, from whence its name, is situate in the middle, between the two oblique superior processes; it is received into the aforesaid sinus of the atlas, and is strongly tied to the *os occipitis*, and to the atlas by ligaments, to prevent its hurting the spinal marrow. All the rest of the vertebræ of the neck are alike. See the account of the vertebræ in general, page 116.

Q. What are the cartilages of the neck?

A. The cartilages of the bones of the neck, and of all the vertebræ in general, are of two kinds, one proper to each vertebra, the other common to the two vertebræ that lie next each other;

other; the first I term cartilages of articulation, the other cartilages of symphysis. The proper articular cartilages of each vertebra of the whole spine are those four which cover the surfaces of the four small oblique or articular apophyses. The cartilages of symphysis lie between the bodies of the vertebræ, one closely joined to each bone; their height and thickness is different in each class of the vertebræ; those of the neck are not so thick as those of the loins, nor so thin as those of the vertebræ of the back; nor are the cartilages of an equal thickness in all their parts; those of the neck and loins appear to be the thickest on the fore side, and those of the back rather thickest on the backside. These cartilages are different from all others in the body, being made up of horizontal, concentrical rings, closest, and thinnest near the center, resembling the other cartilages of the body in nothing but their whiteness and elasticity; the interstices between the rings are filled with a mucilaginous substance, less fluid than that of the joints. All these cartilages yield to compression, and in the inflexions of the spine, the external surface of the cartilage jets out on that side toward which the inflexion is made); they restore themselves afterwards by being freed from compression; so that a man is really taller, after lying some time, than after he has walked or carried a burthen for a great while; owing to the different state of the intervertebral cartilages. The cartilages of the larynx, &c. will be described with the muscles.

Q. What

Q. What are the ligaments of the neck ?

A. All the vertebræ of the spine in general are strongly connected to each other by ligaments, which are very short and strong ; they cross each other obliquely, and are fixed round the edges of the body of each vertebra, covering the intervertebral cartilages, and adhering closely to them ; but the first and second vertebra have both ligaments of a peculiar kind from the rest. All the vertebræ are likewise strongly connected by a ligamentary tube, which lines the inner surface of the medullary canal, representing a long flexible funnel, its cavity at the upper part being equal to that of the occipital foramen, and ending in a small point at the os sacrum : the articular ligaments of the spine are those which tie the glenoid cavities of the atlas to the condyles of the os occipitis ; those that join the cartilaginous surface of the apophysis dentiformis to the anterior cavity of the first vertebra, and those by which all the oblique or articular apophyses are connected together : these are all small, short, strong ligaments, fixed by both extremities round the cartilaginous surfaces of the apophyses, surrounding very closely all the capsular ligaments of these articulations before mentioned. The membranous ligaments of any signification will be described with the muscles.

Q. What are the mucilaginous glands of the neck ?

A. The mucilaginous glands of all the articulations of the vertebræ of the neck are very small, but are accompanied by many fatty molecules

leculæ lying round each joint; the inner surface of the ligamentary tube just now mentioned, is lubricated by an oily or adipose substance, which I have mentioned already. See page 25.

Q. What are the muscles of the neck?

A. Besides those only peculiar to the neck, there are first those of the head and neck conjointly; then those peculiar to the neck, larynx, epiglottis, and pharynx: those of the head and neck conjointly are, biventer cervicalis, complexus, mastoideus, trachelomastoideus, splenius capitis, and rectus capitis internus major. Those only peculiar to the neck, are, interspinales cervicis, intertransversalis cervicis, spinalis cervicis, transversalis cervicis, longus colli, splenius colli; the rest I must omit till I come to describe those of the thorax and abdomen. The muscles of the larynx are, sternothyroideus, hyothyroideus vel cerato thyroideus, cricothyroideus, crico-arytænoideus, lateralis et posticus, thyro-arytænoideus, arytænoideus, and with these I shall first mention the cartilages and membrane of the larynx. The muscles of the epiglottis, viz. arytæno epiglotticus, and the hyo-epiglotticus, to these I shall add the œsophagus. The muscles of the pharynx are, stylopharingæus, pterygopharingæus, constrictor pharyngei vel œsophagus, palato-pharingæus.

Q. What is the biventer cervicalis?

A. The biventer cervicalis arises from the transverse processes of the seven superior dorsal vertebræ, and is inserted into the back part of the os occipitis,

Q. Which

Q. Which is the complexus?

A. The complexus is a broad and pretty long muscle, situate along the back part and side of the neck; it arises from the three superior dorsal vertebræ, and the six inferior vertebræ of the neck, and is inserted with the biventer into the os occipitis and back part of the os temporis. It pulls the head and neck back.

Q. Which is the mastoideus?

A. The mastoideus is situate obliquely between the back part of the ear and lower part of the throat; it is in a manner composed of two muscles, (which Albinus terms sternomastoideus, and cleido-mastoideus) though in fact but one; it arises from the sternum and clavícula in two portions, but soon unites in one, and is inserted into the outer part of the processus mastoideus of the os temporis; over this process it sends off a very broad aponeurosis, which covers the splenius, and is inserted in the os occipitis; it pulls that side of the head it is inserted into towards the sternum, and turns the face towards the contrary shoulder; this muscle, with its fellow, pulls the head and neck toward the breast; but acts with more force on the joints of the neck, than upon the head.

Q. Which is the trachelo-mastoideus?

A. The trachelo-mastoideus arises from the transverse process of the first and second vertebræ of the back, runs up under the splenius, and is inserted into the middle of the backside of the processus mastoideus.

Q. Which is the splenius capitis?

A. The

A. The splenius capitis arises from the spinal processes of the five lower vertebræ of the neck, and the five upper ones of the back, and also the *linea alba colli*. It is inserted into the *os occipitis* a little above the transverse processes of the three superior vertebræ of the neck. This muscle pulls the head and neck backward, and to the contrary side ; but both of them acting together, pull them directly backward.

Q. Which is the *rectus internus major* ?

A. The *rectus capitis internus major* I have already described with the muscles of the head.

Q. Which are the *interspinales cervicis* ?

A. They are muscles arising from the superior parts of each double spinal process of the cervical vertebræ, and inserted into the inferior parts of the same. When these muscles act, they bend the neck backward, drawing the spines of the vertebræ nearer each other.

Q. Which are the *intertransversales cervicis* ?

A. They are situate between the transverse process of the vertebræ like the *interspinales* ; they arise from the lower vertebra of the neck, and are inserted into that next above : these Douglas calls *intervertebrales*.

Q. Which is the *spinalis cervicis* ?

A. The *spinalis cervicis* arises from the transverse processes of the five superior vertebræ of the back ; and is inserted into the spinal processes of the second, third, fourth and fifth vertebræ of the neck. This pulls the neck backward.

Q. Which is the *transversalis cervicis* ?

A. The

A. The transversalis vel semi-spinalis cervicis arises from the oblique processes of the four inferior vertebræ of the neck, and is inserted into the spinal process of the second vertebra of the neck. This is only a continuance of the transversalis dorsi, and moves the neck obliquely backwards, as when we look over the shoulder.

Q. Which is the longus colli ?

A. The longus colli arises laterally from the bodies of the four superior vertebræ of the back, and from the anterior part of the transverse processes of the five inferior vertebræ of the neck; and is inserted into the fore part of the first and second vertebræ of the neck, which it bends forward.

Q. Which is the splenius colli ?

A. The splenius colli arises from the spinal processes of the ninth and tenth vertebræ of the back, and is inserted into the transverse processes of the fifth, sixth and seventh vertebra of the neck.

The rest of the muscles of the neck I shall defer mentioning till I come to speak of those of the thorax and abdomen.

The muscles of the head and neck are most of them obliquely directed; therefore they perform the oblique motions, as well as extension and flexion.

The aspera vel trachea arteria or wind-pipe, I shall describe hereafter, with the contents of the thorax.

Q. What is the larynx ?

A. The larynx is the thick upper part of the
aspera

aspera arteria or wind-pipe, principally composed of five cartilages.

Q. What are the cartilages of the larynx ?

A. They are five, viz. 1. The thyroide, or scutiform cartilage, which stands in the anterior part, and is the largest of the five ; in the fore part of this cartilage is the protuberance called *pomum adami*. 2. The cricoide or annular cartilage. 3, and 4. The arytænoide cartilages, which with the cricoide, make the glottis, (that is the mouth of the larynx) more easily open and contract. Between the arytænoides and sides of the thyroides, there are two small cavities on each side ; in which, if a little drink or bread fall, (as sometimes happens, when we laugh or speak when eating or drinking) it causes a violent cough, and a great tickling. 5. The fifth and last cartilage, which is softer than the rest, is the epiglottis ; its use is to cover the glottis, in eating and drinking ; for the aliments, by their own weight, press it closer down upon the glottis, and they pass over without entering the larynx, into the œsophagus or gullet ; but when the aliments are passed, the epiglottis by its natural action, (which is common to all cartilages) lifts up again, and gives way to the air in breathing. While we speak, or laugh, the glottis must necessarily be opened for the passage of the air in breathing ; therefore it is not convenient to speak while we swallow.

The membrane which invests the larynx is very sensible, and is furnished with a number of exceeding small glands and oscula or openings which

which discharge a lubricating fluid. The ventricles of the larynx are certain hollows, some of them smaller, some larger; they are on the inside of it, under the glottis, and serve to modulate the voice. These, with the dilatation and straitening of the muscles and cartilages of the glottis, give that wonderful variety of notes, the voice is capable of in singing, &c.

Q. Which is the sterno-thyroideus?

A. The sternothyroideus muscle arises from the sternum, and is inserted into the scutiform cartilage which it pulls downward.

Q. Which is the hyothyroideus?

A. The hyothyroideus vel cerato-thyroideus muscle arises from the os hyoides, and is inserted into the scutiform cartilage which it pulls upward.

Q. Which is the cricothyroideus?

A. The cricothyroideus arises from the fore part of the cricoide cartilage, runs under the thyroide cartilage, and is inserted into its inside, which it pulls towards the cricoides, and serves occasionally either to dilate or constrict the glottis.

Q. Which is the crico-arytænoideus?

A. The crico-arytænoideus lateralis arises from the lateral part of the cricoide cartilage; and is inserted into the lateral part of the ary-tænoides; this with its fellow serves to dilate the rimula or glottis.

Q. Which is the crico-arytænoideus posticus?

A. The crico-arytænoideus posticus arises from the back part of the cricoid cartilage, and
is

is inserted into the arytænoides to pull it backward and dilate the glottis:

Q. Which is the thyro-arytænoides ?

A. The thyro-arytænoides arises from the scutiform, and is inserted into the fore-part of the arytænoid cartilage ; it serves together with the following muscle, to constrict the rimula or glottis.

Q. Which is the arytænoides ?

A. The arytænoides is one single muscle, though Winslow and Douglas divide it into two or three. It arises from one arytænoid cartilage, and is inserted into the other, which forms a sphincter for contracting the rimula, and shutting the glottis.

Q. Which is the epiglottis ?

A. The epiglottis has three exceedingly small muscles, (viz. the thyroepiglotticus, arytænoepiglotticus, and the hyoepiglotticus) which serve to cover the glottis in the act of swallowing, and prevent any thing getting into it ; but they are so very minute as to render any further description unnecessary.

The œsophagus, gula or gullet, I shall describe hereafter with the contents of the thorax. The pharynx is the upper part of the œsophagus next the mouth, in which are a number of glands situated, and excretory oscula or openings are frequently discovered with them ; the muscles of the pharynx serve to open and shut the œsophagus.

Q. Which is the stylopharingæus ?

A. The stylopharingæus muscle arises from the styloide process, and is inserted on both
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sides into the styloide and thyroide processes : this muscle with its fellow serve to elevate as well as dilate the pharynx to receive the aliments.

Q. Which is the pterygopharingæus ?

A. The pterygopharingæus spheno vel salpingopharyngæus, arises from the inner wing of the os sphenoides, and is inserted partly into the pterygoide apophysis, and partly into the cartilaginous portion of the Eustachian tube ; its use is to dilate the pharynx, and draw the middle part of it upwards.

Q. Which is the constrictor pharyngei ?

A. The constrictor pharyngei, vel œsophagus, arises like a wing from several parts of the skull, tongue, os hyoides, cricoide and thyroide cartilages, and is inserted into the back part of the pharynx, which it draws to the fore part, and not only constricts the pharynx for pressing down the aliment, but also compresses the tonsillæ, which send out their liquor to lubricate the aliment, whereby it glides the more easily down into the stomach.

Q. Which is the palatopharingæus ?

A. The palatopharingæus arises from the aponeurosis of the circumflexus palati, and is inserted into the stylopharingæus. This muscle more properly belongs to the palate.

Winflow and some others make many subdivisions of the muscles of the pharynx, and give them peculiar names, but they are quite unnecessary.

Q. What are the arteries of the neck ?

A. The

A. The arteries of the neck are the vertebral arteries, and the internal and external carotids; and their branches are called by the names of the parts they are bestowed upon, as laryngæ, pharingæ, &c.

Q. What are the carotid arteries?

A. The carotid arteries are two in number, as I have before observed (in describing the arteries of the head) one called the right carotid the other the left. They arise near each other, from the curvature, or arch of the aorta. The left immediately, but the right most commonly from the trunk of the subclavia, as I have already observed. They run upon each side of the trachea arteria, between it and the internal jugular vein, as high as the larynx, without any ramification. During this course, they may be called carotid trunks, as each of them are afterwards ramified. The trunk having reached as high as the larynx, divides into two large branches, one named the external carotid artery, and the other the internal.

Q. Which is the external carotid artery, and how distributed?

A. The external carotid artery is anterior, the internal carotid posterior; and the former lies more inward, and nearer the larynx than the latter; but the names of the blood vessels are taken from the parts they are distributed to, and not from their situation. The external carotid is the smallest, and yet appears by its direction to be a continuation of the common trunk; its branches may be divided into anterior or internal, and posterior or external. The first ante-
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rior

rior or internal branch goes out from the very origin of the carotid on the inside, and sends off branches to the jugular glands, fat and skin, glandulæ thyroideæ, muscles, and other parts of the larynx, therefore termed laringæ: it likewise sends some twigs to the pharynx. The third anterior branch, or arteria maxillaris inferior, goes to the mastoide muscle, the small flexors of the head, and muscles of the pharynx, and also to the parts just mentioned. The other branches supplying the head and its parts I have already described. See the arteries of the head.

Q. How is the internal carotid artery distributed?

A. The internal carotid artery leaving the general trunk, passes behind the external carotid, a little more backward, and generally runs up without any ramification as high as the lower orifice of the great canal of the apophysis petrosus of the os temporis; therefore sends no branches to the neck.

Q. What is the vertebral artery?

A. The vertebral artery arises from the posterior and upper side of the subclavian; it runs up through all the holes in the transverse apophyses of the vertebræ of the neck, and in its passage sends off branches to the aspera arteria, œsophagus, muscles of the pharynx, larynx, jugular glands, and all the muscles and integuments of the neck, which take their names (as I have before observed) from the several parts they are bestowed on. See arteriæ cervicales.

Q. What are the veins of the neck?

A. The

A. The veins of the neck are the internal and external jugulars, and the vertebral veins, which all arise from the subclavians.

Q. What are the external jugular veins?

A. The external jugular veins are sometimes double from their origin; and when they are single each of them divides afterwards into two; one anterior, and the other posterior or rather superior. The anterior in its passage sends branches to the muscles of the larynx, and to part of the mastoideus; besides those sent to the head and its parts: The posterior, a little higher up than its origin, gives off the vena cervicalis to the vertebral muscles of the neck; near the cervical vein sometimes arises the small vena cephalica, which running down between the pectoral and deltoide muscles unites with the cephalic vein of the arm, which I shall describe hereafter: both the anterior and posterior external jugular run up the neck, between the integuments and the musculus mastoideus.

Q. How is the internal jugular vein distributed?

A. The internal jugular vein is the largest of all those that go to the neck: it runs up behind the mastoideus and coracohyoideus, along the sides of the vertebræ of the neck to the fossula of the foramen lacerum of the basis cranii; in its passage it sends off small branches to the thyroide glands, then the vena gutturalis to the thyroide gland larynx, and neighbouring muscles.

Q. What is the vertebral vein?

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A. The

A. The vertebral vein arises posteriorly from the subclavian or axillaris, sometimes by two stems, sometimes by one, which soon afterwards divides into two; the first and principal stem gives out the vena cervicalis to the neighbouring muscles, and then runs up through the holes of the transverse apophyses of the vertebræ colli. The other stem runs up on the side of the vertebræ, and communicates with the first, running in between the transverse apophyses of the fourth and fifth vertebræ. Thus the vertebral vein accompanies the vertebral artery sometimes in one trunk, sometimes in several stems, through all the holes of the transverse apophyses of the vertebræ, all the way to the great foramen occipitale, communicating with the occipital veins, and small occipital sinuses of the dura mater; these veins as they pass supply the muscles of the neck, and great canal of the spinal marrow, where they form sinuses, which communicate with those on the other side; these sinuses are pretty numerous, placed one above another all the way to the occiput, communicating with one another, and at last with the occipital sinuses of the dura mater.

Q. What are the nerves of the neck?

A. The nerves of the neck proceed from the medulla spinalis, and are seven pair; though by some reckoned eight, as before observed. The first pair goes out between the first and second vertebræ, and after communicating with the tenth and second vertebral, is spent on the musculus flexus colli, splenius, complexus, and teguments of the occipitis. The second pair communicates with the ninth, and with the first

first and third of the neck, and then is distributed to the teguments of the neck, and side of the head, and to the glandula parotis and external ear, where it joins with the portio dura. The third pair of cervical nerves passes out between the third and fourth vertebra, soon communicates with the second, and sending down a large branch, which being joined by another from the fourth pair, forms the phrenic nerve that runs along the pericardium to be lost in the diaphragm, making a small turn round that part of the pericardium which covers the apex of the heart; hence it is that such as have strong palpitations of the heart, feel a pungent acute pain immediately above the right orifice of the stomach: the other branches of the third cervical are distributed to the musculus trapezius, and deltoides, and to the teguments on the top of the shoulder; which with the description of the eighth pair, leads us evidently to the reason that an inflammation of the liver is generally attended with a hiccup, and a suppuration of that viscus, with a violent pain on the top of the shoulder; however, it is not always a certain sign of the liver being suppurated, for any other cause stimulating or stretching the nerves, such as inflammation, wounds, schirrous or steatomatous tumours, &c. may produce the same effect. The fourth cervical pair, after sending off that branch which joins the third to form the phrenic, runs strait to the axilla, where it meets with the fifth, sixth, and seventh cervicals, and first dorsal that escape in the interstices of the

musculi scaleni; these give off nerves to the muscles of the neck, scapula, arm, and thorax, and to the teguments; and the considerable branches into which they are divided are six; but as they properly belong to the hand and arm, I shall describe them with those parts.

Q. What are the glands of the neck?

A. The principal gland of the neck is the thyroïdes; besides which there are a great number of lesser ones by the sides of the carotid arteries and jugular veins, and distributed here and there among the muscles and fat. Those in the anterior part of the neck are called jugulars; and those in the hinder part occipitales and cervicales; and these are all called lymphatic glands.

Q. What are the glandulæ thyroïdæ?

A. The glandulæ thyroïdæ are two lymphatic glands, in figure resembling the new moon; they adhere to the larynx and œsophagus, and are of a red colour; and they have arteries, veins, and nerves, as the larynx. These glands secrete a lubricating fluid, which moistens the cartilages and muscles of the larynx.

The œsophagus, especially towards its upper part, has a great number of glands.

DIALOGUE

DIALOGUE IV.

Of the THORAX and its PARTS.

Q. WHAT is the thorax?

A. The thorax is that large part of the body situated between the abdomen and the neck, and answers to the extent of the sternum, ribs, and vertebræ of the back, both outwardly and inwardly. The anterior part is commonly called the breast; the posterior part, the back; and the lateral parts, the right and left sides. This cavity is lined by a membrane named plura, and divided into lateral cavities by a membranous septum named mediastinum, which is a production or duplicature of the plura. The parts contained in the thorax are the heart, pericardium, trunk of the aorta, trunks of the carotid arteries, subclavian arteries, trunks of the vertebral and axillary arteries, the superior portion of the descending aorta, the intercostal arteries, the vena cava superior, vena azygos, subclavian veins, trunks of the jugular, vertebral and axillary veins, a portion of the aspera arteria, the greater part of the œsophagus, the ductus lacteus, or thoracicus, the lungs, pulmonary artery, pulmonary veins and nerves of the several parts. The cavity of the thorax is terminated downwards by the diaphragm, which separates it from the abdomen. The heart and lungs are properly the viscera

viscera of the thorax, I shall therefore speak of them separately.

Q. What are the bones of the thorax?

A. The bones of the thorax are the twelve superior vertebræ of the back, (from the last vertebra of the neck downward,) the ribs, and the sternum. The claviculæ and scapulæ belonging properly to the upper extremities, shall speak of them hereafter. The whole spine, (as I have before observed) consists of twenty-four vertebræ; those of the neck are already spoken of; the next twelve of the spine belong to the thorax, to these the ribs are articulated. See a general description of the vertebræ, page 115.

The twelve vertebræ of the thorax, or back, differ from the rest in this, that they are larger than those of the neck, and smaller than those of the loins; their acute processes slope downwards upon one another; they have in each side of their bodies a small depression, wherein they receive the round extremities of the ribs, and another in their transverse processes, which receive the little tubercle near the extremity of the ribs. The articulation of the twelfth vertebra of the thorax, with the first of the loins, is by arthrodia; for both its ascending and descending oblique processes are received. The twelve vertebræ of the back have the least motion of any, because their cartilages are thin, their acute processes are long, and very near to one another; and they are fixed to the ribs, which neither move backwards nor forwards. They are bent backwards, behind the center of motion, to make room for the parts contained in the

the thorax ; and that they might not be made too weak by this structure, they are formed for less motion than other vertebræ ; and those in particular which are bent farthest from the center of gravity have the least motion. The forepart of the two upper vertebræ of the thorax are flat forwards, as those of the neck, to make room for the aspera arteria and gula ; the third and fourth vertebræ are acute, to give way to the vessels of the lungs and heart, and bent to the right side, for the better situation of the heart, which makes that side of the breast more convex than the other, and therefore stronger ; which seems advantageous to the right arm, its motions depending upon the support it receives from the breast ; hence the right arm is capable of more perfect actions than the other. The vertebræ of the back are hindered from dislocating forwards by the same provision with those of the neck ; and from luxating backwards by the ribs, which are fastened to the transverse processes of the inferior vertebræ, and against the back part of the body of the next superior ; they also hinder them from dislocating to either side ; but the last ribs are not fixed to the transverse processes of the vertebræ of the thorax ; and therefore it is that luxations are most frequently seen in this part : but the vertebræ of the loins are received into deep cavities, and are tied with much stronger ligaments for their security.

Those that have the vertebræ of the back stick out are said to be bunch-backed ; and in such the cartilages which are between the vertebræ

tebræ are very thin and hard forwards, but considerably thick backwards, where the oblique processes of the superior and inferior vertebræ are at a considerable distance from one another, which distance is filled up with a viscous substance. This inequality of the thickness of the cartilages happens either by a relaxation or weakness of the ligaments and muscles, which are fastened to the back side of the vertebræ, in which case their antagonists finding no opposition, remain in a continual contraction, and consequently there can be no motion in these vertebræ. If this deformity has been from the womb, the bones being at that time soft and tender, the bodies of the vertebræ partake of the same inequality as the cartilages. If the bunch be towards one shoulder, for example towards the right, then the cartilages on that side are very thick, but thin and dry on the other side; on the left side the oblique apophyses come close together; but on the right there is a considerable distance betwixt them, and the ligaments and muscles are greatly extended on the right side, but those on the left are much contracted. If the vertebræ are distorted inwards, all things have a different face; the cartilages, and sometimes the vertebræ, are very thick forwards, but very thin and hard backwards; the acute and oblique processes are very close to one another; and the ligaments upon the bodies of the vertebræ are greatly relaxed, but the muscles and ligaments which tie the processes together are very much contracted.

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These distortions seldom happen in the vertebra of the loins; but such as are so miserable, have little or no motion of their back.

Q. How is the sternum or breast-bone composed?

A. The sternum or breast-bone is generally composed of three spongy bones, sometimes more; in the upper part of this bone, on each side, the clavicles are articulated; the middle part is narrow, the lower part broad; to the end of this adheres a cartilage, called from its figure *cartilago ensiformis vel xiphoides*, which is usually single; sometimes it is double, and bifurcated, and not unfrequently bony throughout. Many are the different ways that this small bone may be formed without any inconvenience. But then some of their positions may be so directed as to bring on a great train of ill consequences; particularly when the lower end is ossified, and is too much turned outwards or inwards, or when the conjunction of this appendix with the second bone is too weak.

There is also frequently found a variety in the form of the cartilages which join the ribs and sternum, sometimes one cartilage serving two ribs, and sometimes a cartilage not joined to any rib; frequently in old people we find parts of them ossified. On each side of the sternum, there are seven cavities, for the articulation of the seven true ribs, to which their cartilages are fixed. The sternum serves to form the anterior part of the breast, to support the ribs and clavicles, and to defend the parts contained in the cavity

cavity of the breast; it also serves for the insertion of the mediastinum, and for the sustaining the heart itself and several muscles.

Q. How many ribs are there, and how are they composed?

A. The costæ or ribs are twenty-four in number, twelve on each side; the middle ribs are the largest; all the ribs are harder, rounder and more incurvated towards their articulations with the vertebræ, than at the other extremity towards the sternum, which is thinner, broader and more spongy. The ribs are distinguished into true and spurious; the true ribs are the seven upper pair, so called, because their cartilages reach the sternum; the spurious, or bastard-ribs, are the five lowest pair, so called as being smaller, shorter, and more cartilaginous than the rest, and not reaching so far as the sternum, which makes their articulations very lax, as they terminate in long, soft cartilages, which bending upwards, are joined to the upper ribs. On the inside of the middle ribs runs a pretty deep sinus, or channel, for the passage of the intercostal vessels, reaching from the end next the spine, almost to its juncture with the cartilage. In the anterior extremities, the cartilages of the seven true ribs are all joined to the sternum; the eighth, ninth, and sometimes the tenth, cohere either with the sternum, or mutually adhere to one another, by means of their transverse cartilages. The anterior extremities of all the others, are loose and free, between the muscles of the abdomen and the diaphragm. In the posterior extremities there are in most of them

them two capitulæ, or heads, which are firmly joined to the vertebræ of the back, yet so as to form movable articulations; for when they are drawn upwards, the cavity of the breast is enlarged for inspiration, and so the contrary. The ribs of infants may be broken inwards like a green stick, without the broken ends being separated; which is often done by the idle custom of careless nurses, taking hold of their breasts, and hoisting them up on one hand frequently: the shape of children's breasts, are many times quite spoiled by such tricks, which occasions weakness of body, crookedness, and other diseases.

Q. What are the cartilages of the thorax?

A. The cartilages of the bones of the thorax are those of the vertebræ, sternum, and ribs; but the cartilages of the vertebræ are already spoken of.

Q. What are the cartilages of the sternum and ribs?

A. The sternum of an adult has commonly sixteen cartilages, (eight on each side) fourteen are articular, the other two symphyfes. Of the articular cartilages, two belong to the articulations of the clavícula, and twelve to those of the true ribs, from the second to the seventh inclusively. The two symphyfes are those between the sternum, and the first rib on each side. There is likewise another symphysis by which the upper portion of the sternum is connected to the lower, the cartilage of which is often obliterated in an advanced age. The apophysis ensiformis is often bony towards the sternum;

num; and more or less cartilaginous at the other end. In very aged persons it has been found entirely ossified, and sometimes wholly cartilaginous, even in adults. All the ribs have cartilaginous portions (as before mentioned) which differ from each other in length, breadth, incurvation, adhesions, and in their extremities are whiter, more polished, broader and thicker in the natural state than when they are dried.

The cartilages of the bastard, or false ribs, are naturally more slender and pliable than those of the true ribs, the middle or inner substance of which acquires the consistence of bones in old age, and their extremities sometimes ossify, and are immovably fixed to the sternum.

Q. What are the ligaments of the sternum and ribs?

A. The sternum has several ligaments by which it is connected with the clavicles and ribs. It is joined to the clavicles by strong short ligaments fixed by one extremity round the edges of its superior notches; by the other, in the extremity of each clavicle; and by the middle to the inter-articular cartilages already explained. All the ribs are connected to the bodies of the vertebræ, by strong short ligamentary fasciuli, fixed by one end round the fossulæ in the vertebræ, and by the other round the head of each rib. The ribs are likewise tied to each other by thin ligaments which go obliquely from the cartilage of each rib to that of the next. The ten uppermost ribs on each side are connected to the transverse apophyses of the vertebræ of the back, by strong, short articular ligaments

ligaments fixed much in the same manner as those between the heads of the ribs and bodies of the vertebræ. Both these articulations are provided with capsular ligaments. The eleventh rib on each side having no articulation with the transverse apophyses, is connected to them by auxillary strong short ligaments fixed in its neck. The last rib is only joined by its head to the body of the twelfth vertebra of the back; but it is connected in a particular manner to the transverse apophysis of the first vertebra of the loins by a broad ligament. The first true rib has no ligamentary connection with the sternum, the cartilaginous symphysis being sufficient. The rest are closely joined to that bone in the same manner as the clavicles abovementioned. The cartilage of the first false rib is joined to that of the last true rib, by several short ligamentary filaments; and the other bastard ribs are connected together much in the same manner.

Q. What are the muscles of the thorax.

A. The muscles of the thorax are, extensor dorsi et lumborum vel multifidus spinæ, scale-nus, serratus, superior et inferior posticus, intercostales externi et interni, triangularis sterni, and diaphragma; besides those whose actions tend chiefly to the upper extremities, which I shall describe hereafter.

Q. Which is the extensor dorsi et lumborum muscle?

A. The longissimus dorsi, multifidus spinæ, semispinalis, sacrolumbalis, &c. are all that portion of flesh betwixt the os sacrum and the neck, which seeing there is no membrane to

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distinguish

distinguish it into several muscles, is all employed in the same actions, I give it the name of *extensor dorsi et lumborum vel multifidus spinæ*, which arises from the upper part of the *os sacrum*, the spine of the *os ilium*, the back parts of the lowermost vertebræ of the loins, and remarkably from those strong tendons which appear on their outsides. That part of this muscle which is known by the name of *sacro-lumbalis* is inserted into all the ribs near their articulations with the transverse processes of the vertebræ, and into the transverse process of the last vertebræ of the neck; besides, as this passes over the ribs, it receives an origin from every rib. The portions of this muscle, which arise from the ribs and are inserted into other ribs above, will necessarily draw the back part of the ribs nearer together, which must always be done as the back extends. The next portion of this muscle, called *longissimus dorsi*, is inserted into all the transverse processes of the vertebræ of the back (belonging to the thorax) and partly into the ribs, and the uppermost transverse processes of the vertebræ of the loins, the upper end of it is neither very distinct from the complexus of the head, nor *spinalis* of the neck. The rest of this muscle, known by the names of *femio-spinalis*, *facer*, &c. arises also from all the transverse and oblique processes of the loins and back; every portion, except the lowermost, passing over five joints, is inserted into the spinal process of the sixth vertebra above its origin, all the way up the back, and at the neck commences *transversalis colli*. Besides

sides the uses of the extensor dorsi et lumborum, which its name implies, it and its fellow alternately raise the hips in walking, which any one may feel by laying his hand upon his back.

Q. Which is the scalenus muscle ?

A. The scalenus arises from the transverse processes of the second, third, fourth, fifth, and sixth cervical vertebræ: It is inserted in three parts, into the first, second and sometimes the third rib, being thus divided for the transmission of the subclavian vessels ; hence some anatomical writers have made three muscles of it, under the names of first, second, and third scalenus, or prior, medius, and posticus. This muscle may bend the neck ; but its chief use is to support the upper ribs, and partly elevate the thorax.

Q. Which is the serratus superior posticus ?

A. The serratus superior posticus lies immediately under the rhomboides, and arises from the spinal processes of the two inferior vertebræ of the neck, and the three superior of the thorax ; but it is inserted at the bending of the second, third, and fourth ribs : this, with the scalenus, sustains the upper ribs, that they might not be pulled downward by the depressors of the ribs in expiration, as the lower ribs are upward in inspiration.

Q. Which is the serratus inferior posticus ?

A. The serratus inferior posticus arises from the spinal process of the three superior vertebræ of the loins, and two inferior of the thorax ; and is inserted at the bending of the ninth,

tenth, and eleventh ribs. It pulls down the ribs in expiration.

Q. Which are the *intercostales externi et interni*?

A. The *intercostales externi et interni* are eleven pair on each side, in the interstices of the ribs; from their situations distinguished into external and internal; they all arise from the under edge of each rib, and are inserted into the upper edge of the rib below. The external are largest backward, having their first beginnings from the transverse processes of the *vertebræ* like distinct muscles, which some call *levator costarum*. The internal run all from above obliquely backward, being thickest forward and thinnest toward the spine; these are also continued betwixt the cartilages of the sternum, which fibres are perpendicular to the cartilages; and between the cartilages of the lowest ribs, they are inseparable from the *obliquus ascendens abdominis*. These muscles, by drawing the ribs nearer to each other, pull them all upward, and dilate the thorax, they being sustained at the top by the *scalenus* and *serratus superior posticus*.

Q. Which is the *triangularis sterni* muscle?

A. The *triangularis sterni* arises from the lower and interior part of the sternum, and internally from the *cartilago ensiformis*; it is inserted on each side into the cartilages of the fourth, fifth, sixth, and seventh true ribs; and it is one of the constrictor or depressor muscles of the breast, which pulls the ribs to the bone of the

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the sternum, and thereby bends its cartilages in expiration.

Q. Which is the diaphragma?

A. The diaphragma, is the transverse muscle which separates the thorax from the abdomen. This is a very broad and thin muscle, situated at the basis of the thorax, and serving as a transverse partition to separate that cavity from the abdomen: for this reason the Greeks termed it diaphragma, and the Latins, septum transversum. Its upper superficies is convex, and its lower concave. It is connected with the sternum, the spurious ribs, the pericardium, the mediastinum, and the vertebræ of the loins. There are in the diaphragm two large foramina; the first is in the left side of it, and gives passage to the gula, and the par-vagus; the second is in the right side, and the lower trunk of the vena cava passes through it; there is also an interstice between the two heads of the lower part; through which pass the aorta, the vena azygos, and the ductus thoracicus. The diaphragm is covered with a membrane on the upper part from the pleura; on the lower from the peritonæum. This muscle arises on the right side by a process from three lumbal vertebræ, and one of the thorax; and on the left, from one superior of the loins, and inferior of the thorax; and is inserted in the lower part of the sternum, and the five inferior ribs. The middle of this muscle is a flat tendon, from whence the fleshy fibres begin, and are distributed, like radii, from a centre to a circumference. The uses of the diaphragm are, first, to assist in respiration;

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piration ; for in taking in the breath it is pressed downwards, and in expiration, it rises upward, into the cavity of the thorax : secondly, to assist the necessary motions of the contents of the abdomen, viz. of the stomach, intestines, liver, and spleen ; and in the promoting the secretions of the chyle, bile, &c. and, lastly, for assisting the expulsion of the fæces, the urine, the fœtus in parturition, and of the secundines. When the diaphragm acts alone, it constricts the thorax, pulling the ribs downward, which action is generally performed to promote the ejection of the fæces.

Q. What are the viscera of the thorax ?

A. The viscera of the thorax are properly only the heart and lungs ; but that cavity also contains the plura, mediastinum, pericardium, a portion of the trachea arteria, and the greater part of the œsophagus, besides the thoracic duct, blood vessels, nerves, and glands.

Q. What is the pleura ?

A. The pleura is a fine smooth, robust, and tense membrane, adhering very closely to the inner surface of the ribs, sternum, and intercostal muscles, and lining the whole cavity of the thorax, except the diaphragm, which is covered with no other than its own proper membrane. Its structure resembles two sacks or bags (one on each side the thorax) which contains the two lobes of the lungs ; from the conjunction of these two sacculi of the pleura in the middle of the thorax, is formed the mediastinum, which I shall speak of by and by. The pleura is composed of a double membrane of a
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very firm texture, and plentifully stored with blood vessels and nerves, in all which it resembles the peritonæum, (which I shall describe hereafter) and likewise, in that it is made up of an inner true membranous lamina, and a cellular substance on the outside, which is a production or continuation of the lamina. Its vessels are arteries, veins, nerves, and lymphatics. The arteries arise from the intercostals; the diaphragmatic, and the mammary ones, and are very numerous; the veins from the veins of the same name with those arteries; but all of them discharge themselves into the trunk of the vena azygos, and the upper trunk of the cava. The nerves are from the vertebræ of the thorax, and the diaphragmatic ones. The lymphatics all run to the ductus thoracicus. The use of the pleura is to make the inside of the thorax smooth and equal, and to lubricate and strengthen the whole cavity.

Q. What is the mediastinum?

A. The mediastinum, is a double membrane continuous to the sternum, situated under it, and adhering firmly to it; it is formed by the continuation of the pleura, which comes from the sternum, and goes through the middle of the thorax to the vertebræ, dividing the cavity of the thorax longitudinally into two parts; but as it is not exactly under the middle of the sternum, but somewhat to the left side, the right part of the thorax is larger than the left: hence may be judged the uncertainty of trepaning the sternum, recommended by the ancients in some cases. This double septum, or partition, contains in its duplication,

ture, the heart in its pericardium, the vena cava, the œsophagus, and stomachic nerves. The mediastinum receives veins and arteries from the mammary and diaphragmatic vessels, and sometimes has proper and particular ones of its own from the aorta and cava: these are then called the mediastinal vessels. Its nerves, which are small, are from the diaphragmatics, and the par vagum. It has a number of lymphatics, which run to the ductus thoracicus. The uses of the mediastinum are two: the first is to divide the breast longitudinally into two parts, by which several great purposes are answered; as, 1. That on one of the lobes being ulcerated, the other might not be immediately affected. 2. That water, matter, or any thing else contained in one part of the thorax, might not at the same time affect both parts of the lungs. 3. That in case of a wound in one side of the thorax, respiration might be continued in the other, and the person not be immediately suffocated. The second general use of the mediastinum is to support the heart in its pendulous state, for the benefit of its free motion, especially when we lie on our backs.

Q. What are the lungs?

A. The lungs are the largest viscus of the thorax: they are situated in the two sides of it, with the heart as it were between them; and are connected by means of the mediastinum with the sternum and vertebræ; with the heart by means of the pulmonary vessels, and immediately with the aspera arteria. The colour of the lungs in infants is a fine florid red; in adults it is darker,
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and in old people livid, or variegated with black and white. When inflated they have some resemblance to the hoof of an ox; and are convex on the upper side next the ribs, and concave underneath next the diaphragm. They are divided into two large lobes, one seated on each side of the mediastinum; the left lobe, which is the smallest, is subdivided into two lobules, and the right, which is larger, is subdivided into three lobules. The double membrane, with which the lungs are surrounded, is continuous externally with the pleura, and internally not only immediately covering the substance of the lungs, but also all its inner lamina, and fills up the interstices which are between the bunches of the small lobes or lobules with little vesicular cells. The fine capillary blood vessels are so thick upon this membrane, that it seems to be nothing but a net-work of veins and arteries. The substance of the lungs is spongy, or vesicular, and they seem, indeed, entirely composed of an infinite number of little lobes, or lobules, of various figures and magnitudes; but their surfaces are so adapted to one another, as to leave but very few and small interstices. These lobes are disposed like so many bunches of grapes, upon the sides of the bronchia, or ramifications of the trachea (described hereafter); each little lobe, or lobule, contains within its own proper membrane an infinite number of small orbicular vessels, which leave small interstices between them, full of little membranes, like those which tie the lobes together,

together. The bronchia, in their origin, are formed of imperfect annuli, and in their progress of cartilaginous and membranous segments, very curiously connected and joined together; these have their origin from the trachea; and after being subdivided into innumerable ramifications, finally terminate in those small vesicles which form the greater part of the substance of the lungs, as before mentioned. These extremities (of the branches of the bronchia) open into the cavity of the vessels, which are properly formed by its membranes; but the capillary blood vessels are only spread upon the vesicles like a net, with frequent and large inosculations. The vessels which enter the lungs are the trachea, or aspera arteria, by which we draw in the air, (hereafter to be described.) The arteria pulmonalis, which comes from the right ventricle; see page 22, and the vena pulmonalis, whose trunk opens into the left ventricle of the heart, see page 34; each of these divides into two branches, for the two great lobes of the lungs, where they are subdivided into as many branches as there are little lobes or vesicles in the lungs. Wherever there is a branch of the trachea, there is also a branch of the vein and artery; and the trachea is always in the middle. Upon the branches of the trachea arteria (which I observed before are termed bronchia) runs a small artery called arteria bronchialis, and a small vein called vena pneumonica; the artery comes from the aorta, and the veins open into the subclavian. Upon the bronchi, even to the minutest ramifications, run likewise the fine threads

threads of the eighth pair of nerves. Besides these, the lungs have lymphatics, which discharge themselves into the thoracic duct; but they are smaller, and make more frequent inoculations than are observed any where else. The lungs of animals before they have been dilated with air, are specifically heavier than water; but upon inflation, they become specifically lighter, and swim in water; which experiment may be made to discover whether a dead child was still-born or not: but if the child has breathed but a little, and the experiment is made long after, the lungs may be collapsed, and grow heavier than water, as I have found by experiment, which may sometimes lead a man to give a wrong judgment in a court of judicature, but then it will be on the charitable side of the question. Adhesions of the lungs to the pleura are in men so common, I know not how to call it a disease; they being found so, more or less, in most adult persons, and without any inconvenience, if the lungs are not rotten.

Q. What is the pericardium?

A. The pericardium, or heart purse, is an exceeding strong membraneous bag, loosely including the heart; the figure of the pericardium is conic, like that of the heart itself; its size is such as can conveniently contain the heart, without pressing upon it; it is connected with the mediastinum, with a great part of the diaphragm, and with the large vessels of the heart, which, together with this covering, sustains also the heart itself in its place. The pericardium is composed of a double membrane; the exterior
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one is common with the pleura and mediastinum; the interior is proper, lubricous, and is continuous with the coats of the larger vessels. This membrane, when expanded upon the finger, frequently discovers a great number of foraminula, or little apertures. The arteries and veins of the pericardium are from those of the mediastinum and diaphragm, and its nerves are also from the diaphragmatics. Its lymphatics all run to the thoracic duct. The uses of the pericardium are, to support the heart in a pendulous state, especially when we lie down; to defend the heart from the cold air taken in at the lungs, to preserve it from being injured by water, by matter, or any other extraneous fluid in the cavity of the thorax; and to contain a liquor to lubricate the surface of the heart, facilitate its motions, and abate its friction against the pericardium. The pericardium is found sometimes in persons who have been long hectic to cohere with the substance of the heart; and there have been instances of its having been wholly wanting:

Q. What is the heart?

A. The heart is a muscular body, included in the pericardium (just now described) and situated in the cavity of the thorax, nearly in the middle of the breast, on the anterior part of the diaphragm, between the lobes of the lungs and the two laminæ of the mediastinum. The heart is the primary organ of the circulation of the blood, and consequently of life. It is in some measure of a conical figure, flatted on the sides, round at the top or apex and oval at the basis

basis; its lower part is plane, and the upper part convex. Its situation is nearly transverse, or horizontal; so that its base is in the right side, upon the fourth and fifth vertebrae of the thorax; and its apex or point is inclined downwards, lying with the greatest part of its bulk in the left side of the thorax, and consequently it is there that the pulsation is felt. Its base is fixed by the vessels going to and from it; but its apex is free, and is received in a kind of cavity of the left lobe of the lungs, as may be observed, the lungs being extended with air. This incumbrance on the left lobe of the lungs seems to be the cause of that side's being most subject to the pleuritic pains, which have generally been found upon dissection to proceed from inflammations in the lungs. The length of the human heart is about six fingers breadth, at the base about five fingers, and its circumference about thirteen.

At the basis of the heart, on each side, are situated two appendices called auricles, to receive the blood; the right from the two venae cavæ, and the left from the pulmonary veins. (See vena cava and pulmonaris.) In the right auricle, at the meeting of the cavæ, is an eminence called tuberculum Loweri, which directs the blood into the auricle; immediately below this tubercle, in the ending of the cava ascendens is the vestige of the foramen ovale, and near this in the auricle, is the mouth of the coronary veins. The left auricle is much less than the right; but the difference is supplied by a large muscular cavity, which the veins
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from the lungs afford in that place. The sides of this muscular cavity are thicker than the sides of the right auricle, in about that proportion in which the left ventricle of the heart is stronger than the right; their uses being to receive blood from the veins that lead to the heart, and press it into the ventricles, as a strength in each auricle proportionable to the strength of the ventricle that it is to fill with blood, seems necessary; and this different thickness of the coats of the auricles makes the blood in the left, which is thickest, appear through it of a paler red; but when it is let out of the auricles, it appears alike from both; which they would do well to examine, who affirm the blood returns from the lungs of a more florid colour than it went in, and offer it as an argument of the blood's being mixed with air in lungs.

There are also two cavities in the heart called its ventricles, which receive the blood, and are hollow muscles, or two cavities in one muscle. Both these cavities receiving the same quantities of blood in the same times, and always acting together, must be equal in size, as it is generally supposed they equally discharge what they contain at every systole; nevertheless, the left appears less than the right, it being found empty in dead bodies, and the right usually full of blood. Each ventricle opens at the base by two orifices, one of which answers to the auricles, the other to the mouth of a large artery; the former receives the blood through the veins, the latter delivers the blood through the arteries. The right ventricle is situate anteriorly,
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and is thinner and weaker in its circumference, but usually much more capacious than the left : it receives the blood from the vena cava and the right auricle, and delivers it into the pulmonary artery, to be carried to the lungs. The left ventricle is much stronger and thicker in its sides, but is narrower and smaller than the right ; it receives the blood from the pulmonary vein and the left auricle, and drives it very forcibly into the aorta, and so through the whole body.

Over the orifices of the veins at the entrance of the auricles in each ventricle, are placed valves, to hinder a return of blood while the heart contracts ; those in the right ventricle are named tricuspides, those in the left mitrales : in the beginning of each artery from the heart are placed three valves, which hinder a return of blood into the ventricles. The first sort of valves open inward toward the ventricles, allowing the blood to enter the heart, but hindering it from returning the same way ; the other kind open outward from the heart toward the great vessels, suffering the blood to go out of the heart, but hindering it from returning ; these last are termed semi lunar valves ; but those in the pulmonary artery are more properly named figmoidales, and those in the aorta femilunares.

The inner surface of the ventricles is very uneven, many eminences and cavities being observable therein ; the ventricles are divided by a septum running between the edges ; and their most considerable eminences are thick fleshy productions

productions called *colummæ*. To the extremities of these pillars are fastened several tendinous cords, the other ends of which are joined to the *valvulæ tricuspidæ*. The cavities of the inner surface of the ventricles are small deep *fossulæ* or *lacunæ* placed very near each other, with small prominent interstices between them. The greatest part of these *lacunæ* are orifices of the venous ducts.

The blood vessels of the heart are of two kinds, common and proper; its proper or peculiar vessels being the coronary arteries and veins. The common vessels of the heart are two veins, called the *vena cava* and the *vena pulmonalis*; and two arteries, the pulmonary one, and aorta. The nerves of the heart are small, and arise from the *par vagum* and *intercostals*. See Dialogue I. arteries, veins and nerves.

Q. Which are the coronary arteries?

A. The coronary arteries are two in number, and go out from the beginning of the aorta, and afterwards spread themselves round the basis of the heart, to the substance of which they send numerous ramifications. One turns to the right hand, the other to the left: the right coronary artery runs in between the basis and right auricle all the way to the flat side of the heart, and so goes half-way round: the left artery has a like course between the basis and left auricle, and before it turns on the basis, it sends off a capital branch, which runs between the two ventricles. Another principal branch goes off from the union of the two arteries on the flat side of the

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the heart, which running to the apex, there joins the other branch.

Q. Which are the coronary veins ?

A. The coronary veins are distributed exteriorly much in the same manner as the arteries, but they end partly in the right auricle, and partly in the right ventricle ; their trunk principally in the former, by a particular orifice, furnished with a semi-lunar valve. They likewise terminate in the left ventricle, but in smaller numbers. All the contrary veins and their ramifications communicate with each other.

Q. What is the trachea or aspera arteria ?

A. The trachea or aspera arteria, vulgarly called the wind-pipe, is a large canal, partly cartilaginous, and partly membranous, extended from the mouth to the lungs. It is situated in the middle and anterior part of the neck, and is connected with fauces, lungs, and œsophagus. Its mouth or entrance is, by anatomists, called the larynx, the rest aspera arteria. The aspera arteria extends from the larynx to the bronchia, or lungs, being in some measure of a conic figure. Its beginning is cylindrical, and capable of admitting a finger ; and its other end is somewhat narrower. It runs down into the thorax, under the sternum, between the two pleuræ, through the upper space left between the duplicature of the mediastinum, behind the thymus gland. Having reached as low as the fourth vertebra of the back and curvature of the aorta, it divides into two lateral parts or branches, one towards the right hand, the other towards the

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left,

left, which enter the lungs, and are distributed through them in the manner there described : these two branches are called bronchia, and that on the right side is shorter than that on the left ; whereas the right pulmonary artery is the strongest. The trachea is made up of segments of circles, or cartilaginous rings, disposed in such a manner as to form a canal open on the back part ; the cartilages not going quite round ; but this opening is filled by a soft glandular membrane, which completes the circumference of the canal.

These circles or hoops, are in number from sixteen to twenty, and are connected by a very strong, elastic, membranous ligament, fixed to their edges.

The canal of the *aspera arteria* is lined on the inside by a particular membrane, which appears to be partly fleshy, or muscular, and partly ligamentary, perforated by an infinite number of small holes, more or less imperceptible, through which a mucilaginous fluid continually passes to defend the inner surface of the trachea against the acrimony of the air which we breathe. At the angle of the first ramification of the trachea arteria, we find on both the fore and back-sides certain soft, roundish, glandular bodies, of a livid colour, and of a texture partly like that of the thymus; and partly like that of the *glandulæ thyroïdes*. There are other glands of the same kind at the origin of each ramification of the bronchia, but they decrease proportionably in number and size : they are fixed immediately

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to the bronchia, and covered by the interlobular substance; and they seem to communicate by small openings, with the cavity of the bronchia, as before observed.

The uses of the trachea are to assist in deglutition, and to be assistant to the lungs. On the exterior part of the trachea are the thyroide and bronchial glands, (which I shall hereafter mention) which secrete a humour to moisten it: its arteries are from the external carotids, the veins from the jugulars, and the nerves from the recurrent ones of the plexus cervicalis.

Q. What is the œsophagus?

A. The œsophagus, or gullet, is that membranous canal which conveys the aliment from the mouth to the stomach. It is partly muscular, and partly membranous, situated behind the trachea arteria, and before the vertebræ of the back, from near the middle of the neck, down to the lower part of the thorax, from whence it passes into the abdomen, through a particular hole of the small or inferior muscle of the diaphragm, and ends at the upper orifice of the stomach: Its upper part is wide and open, spread behind the tongue to receive the masticated aliment, and is termed pharynx, the muscles of which I have already spoken of: The substance of the œsophagus is composed of several coats, almost in the same manner as the stomach, of which it is the continuation. The first coat, while in the thorax, is formed only by a duplicature of the posterior part of the mediastinum, and is wanting above the tho-

rax, and in the neck, where the outer coat of the œsophagus is only a continuation of the cellular substance belonging to the neighbouring parts. The second coat is muscular, made up of several strata of fleshy fibres. The outermost are chiefly longitudinal, but are not all continued from one end of the canal to the other. The following strata are obliquely transverse, the next to these more transverse, and the innermost are turned a little obliquely the contrary way; they cross each other irregularly in many places, but are neither spiral nor annular. The third coat is termed the nervous coat, and is like that of the stomach and intestines. It is differently folded or plaited, according to its length; being much wider than the muscular coat, and surrounded by a whitish fine, filamentary substance, like a kind of cotton, which when steeped in water, swells and grows thicker. The fourth or innermost coat resembles, in some measure, that of the intestines, except, that instead of the villi, it has small and very short papillæ. It is folded lengthwise, like the third coat, so that the œsophagus when cut across, represents one tube within another. Through the pores of this coat, a viscid lymph is continually discharged.

The œsophagus, from its very beginning, turns a little to the left hand, and naturally runs along the left extremities of the cartilages of the *aspera arteria*. The arteries of the œsophagus are from the carotids, the aorta, the intercostal, and the cælic. The veins are from the jugulars,

lars, the azygos, and the coronary veins of the stomach; and the nerves from the par vagum. There are also certain excretory ducts, called ductus excretorii novæ vercelloni, which arise from the glands, and convey a saltish liquor into the œsophagus and stomach; see the glands of the thorax. The glands, from which these ducts have their origin, are of three kinds, viz. the gastric glands, which are conglomerate, and are situated near the left orifice of the stomach, the dorsal ones, which are situated near the fifth vertebra of the thorax; and the bronchial, thyroide, and tracheal, described below. The use of the œsophagus is to carry the meat from the mouth into the stomach, by means of the muscles of the pharynx and fleshy fibres of the gula, which perform its peristaltic motion, and also for a commixtion of the liquid serving for digestion.

Q. What are the arteries of the thorax?

A. The arteries of the thorax (besides those of the viscera I have already mentioned) are various, and proceed chiefly from the aorta already spoken of. The branches of the ascending aorta in the thorax take their names from the parts they are bestowed on; the principal branches are arteriæ coronariæ, carotides, subclaviæ; from the latter arise the thymica, diaphragmaticæ, pericardia, mediastina, trachealis, and mammaria interna: these from the aorta ascendens. From the superior portion of the aorta descendens arise arteriæ bronchiales, œsophageæ, intercostales, to their parts of the tho-

rax. The coronary and carotid arteries are already described.

Q. Which are the subclavian arteries ?

A. The subclavian arteries are so named from their situation near the clavicles, in the transverse direction of which they run ; they are two in number ; one right, the other left. These arteries arise from the arch of the aorta, on each side of the left carotid, which commonly lies in the middle between them ; but when both carotids go out separately, they both lie between the subclaviæ. These arteries terminate, or rather change their name, above the middle of the two first ribs, between the anterior insertions of the musculi scaleni. They give off small arteries to the mediastinum, pericardium, and aspera arteria ; afterwards they send off the mammaria interna, cervicalis, and vertebralis, and sometimes an intercostal artery to the first ribs. The right subclavian, at about a finger's breadth from its origin, also often produces the common carotid of the same side.

Q. Which is the arteria thymica ?

A. The arteria thymica arises from the subclavian, communicating with and receives some branches from the mammaria interna, and has some from the intercostalis superior. The mediastina and pericardia the same.

Q. Which is the arteria pericardia ?

A. The arteria pericardia also arises from the anterior middle part of the subclavian, and runs down upon the pericardium all the way to the diaphragm, to which it sends some small ramifications.

Q. Which

Q. Which is the arteria mediastina?

A. The mediastina arises sometimes immediately after the thymica, and is distributed principally to the mediastinum.

Q. Which is the arteria trachealis?

A. The trachealis runs up from the subclavia, in a winding course, along the aspera arteria, to the glandulæ thyroideæ and larynx, detaching small arteries to both sides, one of which runs to the upper part of the scapula.

Q. Which is the arteria mammaria interna?

A. The internal mammary artery comes from the anterior and lower side of the subclavian near the middle of the clavicle, and runs down for about one finger's breadth behind the cartilages of the true ribs, an inch distant from the sternum. In its passage, it sends branches to the thymus, mediastinum, pericardium, pleura, and intercostal muscles; and through these muscles, and between the cartilages of the ribs, to the pectoralis major, mammæ, membrana adiposa, and skin. Several of these branches communicate by anastomoses with the mammaria interna, and other arteries of the thorax. Afterwards it goes out of the thorax, on one side of the appendix ensiformis, and is lost in the musculus abdominis rectus, a little below its upper part; communicating at this place with the epigastric artery, and in its course it gives off branches to the peritonæum, and the anterior parts of the abdominal muscles.

Q. Which is the arteria intercostalis superior?

A. The superior intercostal artery, when it does not go out from the trunk of the aorta de-

scendens, commonly arises from the lower side of the subclavian, and runs down on the inside of the two, three, or four uppermost true ribs, near their heads, sending off under each rib a branch, which runs along the lower edge, and supplies the intercostal muscles, and neighbouring parts of the pleura. These branches all communicate with one another, up and down the intercostal muscles. They also give branches to the muscoli sterno-hyoidei, subclavius, vertebrales, and bodies of the vertebræ, pectoralis, and through the notches of the first four vertebræ to the medulla spinalis.

Q. Which are the arteriæ bronchiales?

A. The bronchial arteries go either from the foreside of the superior part of the descending aorta, first intercostal, or arteriæ œsophagea. They rise sometimes single, sometimes double, sometimes triple, and adhere every where firmly to the bronchia; their branches or ramifications, communicate sometimes with those of the pulmonary vein, arteria œsophagea, coronaria cordis, and vena azygos.

Q. Which are the arteriæ œsophageæ?

A. The œsophageæ are generally two or three in number, though sometimes but one. They arise anteriorly from the aorta descendens, and are distributed to the œsophagus, &c. Sometimes the uppermost œsophagus produces a bronchial artery.

Q. Which are the arteriæ intercostales inferiores?

A. The inferior intercostals are commonly seven or eight on each side, and sometimes ten,
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when the superior intercostals arise likewise from the aorta descendens; in which case, these run obliquely up upon the ribs. They arise along the backside of the descending aorta generally in pairs, all the way to the diaphragm, and run transversely toward each side, on the bodies of the vertebræ. Those on the right side pass behind the vena azygos; and afterwards, they run to the intercostal muscles, along the lower edge of the ribs, all the way to the sternum or near it. They send branches to the pleura, vertebral muscles, muscles of the thorax, and to the upper portions of the muscles of the abdomen, and they communicate with the arteriæ epigastricæ and lumbares. Before they take this course along the ribs, &c. they detach branches to the great canal of the spina dorsi, which communicating with the like arteries from the other side of the spine, form a kind of arterial rings, as do the arteriæ lumbares. After the above course, each intercostal about the middle of the rib sends a principal branch internally, and another externally; those that run upon the false ribs are afterwards distributed to the abdominal and other neighbouring muscles, particularly to those of the diaphragm. They also communicate with the lumbares, and sometimes with branches of the hypogastricæ.

Q. Which is the arteria mammaria externa vel thoracica superior?

A. The external mammary or superior thoracic artery, runs down in a winding course on the lateral parts of the thorax, and crosses the ribs,

ribs. It gives branches to the two pectoral muscles, to the mamma, musculus subclavius, serratus major, latissimus dorsi, and to the upper portions of the coraco-brachialis and biceps.

Q. Which is the arteria thoracica inferior?

A. The inferior thoracic artery runs along the inferior costa of the scapula to the musculus subscapularis, teres major and minor, infra spinatus, serratus major, latissimus dorsi, and the neighbouring intercostal muscles, communicating with the arteriæ scapulares.

Q. What are the veins of the thorax?

A. The veins of the thorax are also various, and proceed chiefly from the vena cava superior already spoken of. The principal branches are, venæ coronariæ cordis, vena azygos vel sine pari, venæ intercostales, pectoralis internæ, (from the latter arise the diaphragmaticæ superiores, mediastinæ, mammariæ internæ, thymicæ, pericardiæ, and gutturales, or tracheales) subclaviæ, jugulares, vertebrales. The coronary veins of the heart, the jugulars and vertebrales, I have already spoken of.

In describing the veins, I shall begin with the great trunks, and end with the ramifications and capillary extremities, according to their several divisions and subdivisions, as I have before observed.

Q. Which is the vena azygos, or sine pari?

A. The vena azygos, or sine pari, is a vein arising within the thorax on the right side, having no fellow on the left; whence it is called azygos, or vena sine pari. This vein is very considerable, and arises posteriorly from the
vena

vena cava superior, a little above the pericardium, and is immediately afterwards bent backward over the origin of the right lobes of the lungs; forming an arch which furrounds the great pulmonary vessels on that side, as the arch of the aorta does those of the left side, with this difference only, that the curvature of the azygos is almost directly backward, whereas that of the aorta is oblique. From thence it runs down on the right side the vertebræ dorsi, on one side the aorta, and before the intercostal arteries. I have seen this vein extremely large, like the trunk of the inferior cava, from the diaphragm to the origin of the renales; the true cava being through all this space very narrow, or of the size of the ordinary azygos. The vena azygos sends out first of all two or three small veins from the top of the arch, one of which goes to the aspera arteria, and the others partly to that and partly to the bronchia, by the name of venæ bronchiales, accompanying the ramifications of the bronchial artery. And from the extremity of the arch proceeds a small trunk common to two or three small veins, called intercostales superiores dextræ, which bring back the blood from the first three series of intercostal muscles, and from the neighbouring parts of the pleura. These intercostal veins send branches through the intercostal muscles to the serratus major posticus, &c. and afterwards they run along the interstices between the ribs, communicating with the venæ mammariæ. They likewise send small branches backward to the vertebral muscles, and canal of the spine, where they

they communicate with the venal circles or sinuses, which bring back the blood from the medulla spinalis. As the azygos runs down it sends off the inferior intercostal veins on the right side, one going to each series of intercostal muscles; these veins run along the lower edges of the ribs, and perforate the muscles which go to the posterior and external parts of the thorax. The azygos sends off likewise the left intercostal veins, but seldom the whole number; also six or seven, more or less, inferior intercostals, which run between the aorta and vertebræ; and the same ramifications on the right side, and likewise some ramifications to the œsophagus; but sometimes these distributions vary, and are not in all subjects alike. Just below the last rib, the azygos sends off a large branch to the muscles of the abdomen, communicating with the last two intercostal veins: sometimes this extremity communicates either mediately or immediately with the vena adiposa, and even with the vena spermatica.

The diaphragmaticæ superiores, mediastinæ, mammariæ internæ, thymicæ, pericardiæ, and tracheales, are small veins disposed in pairs to the right and left, behind the sternum and parts near it, and some called venæ pectorales internæ.

Q. Which is the vena mediastina?

A. The right vena mediastina goes out anteriorly from the trunk of the superior cava, a little above the origin of the azygos; the left comes from the subclavia.

Q. Which is the vena diaphragmatica superior?

A. The

A. The right superior diaphragmatica arises near the mediastina, and its branches are distributed to the pericardium. The left comes from the left subclavian, a little below the origin of the mammaia.

Q. Which is the vena mammaia interna?

A. The right internal mammaia arises from the vena cava, a little below the angle of the bifurcation. It runs along the posterior edge of the sternum, and on the cartilaginous extremities of the right ribs, together with the artery of the same name; it also sends the diaphragm a branch, and communicates with those veins. Afterwards it gives small branches to the mediastinum and others between the ribs to the integuments. The left internal mammaia arises anteriorly from the left subclavian, opposite to the cartilage or anterior extremity of the first true rib.

Q. Which is the vena thymica?

A. The right vena thymica, when it arises separately, goes out from the bifurcation; this vein often reaches no lower than the inferior part of the thymus. The left vein of the same name comes from the left subclavian, almost opposite to the sternum.

Q. Which is the vena pericardia?

A. The vena pericardia seems to go out rather from the origin of the right subclavian, but in this there are many varieties. It goes to the upper side of the pericardium, and other neighbouring parts; the left pericardia comes sometimes from the left subclavian, and sometimes from the mammaia on the same side.

Q. Which

Q. Which is the vena trachealis?

A. The right trachealis goes out from the upper part of the bifurcation above the mamma of the same side, sometimes more backward, and sometimes from the subclavia. It is distributed to the glandulæ thyroïdæ, thymus, and bronchialis, trachea arteria, and musculi sterno-hyoidei: it communicates with the internal jugular vein. The left trachealis comes from the upper, or posterior part of the left subclavian near its origin. Of all these small veins, the mamma interna, is the most considerable.

Q. Which is the vena subclavia?

A. The right subclavian vein (as has been already said) is very short; and its course very oblique, so that it appears to rise higher than the left vein. It sends off, first of all, four large branches, already mentioned, viz. the vertebralis, which is the first and most posterior; the jugularis et axillaris. It sends off four large branches besides the small pectoral veins, and receives the ductus thoracicus. Also a small trunk for the left superior intercostals, which are sometimes six in number, and communicate with the inferior intercostals, and with a branch of the vena azygos. This small common intercostal trunk furnishes likewise the left bronchialis. Each subclavian vein, near the middle of the clavicle, sends off a branch called cephalica, which descends near the surface of the body, between the deltoides and pectoralis

pectoralis major, and reaches the arm in the manner which shall be described hereafter.

Q. Which is the vena cava inferior?

A. The two inferior vena cava having run down about a quarter of an inch from the right auricle of the heart, within the pericardium (as has been already said) pierces that membrane, and the tendinous portion to the diaphragm, and which adhere very closely to each other; at this place it gives off the venæ diaphragmaticæ inferiores vel phrenicæ, the other branches, &c. of the inferior cava I shall describe hereafter.

Q. Which are the venæ phrænicæ?

A. The venæ phrænicæ are sent off from the vena cava inferior, as above mentioned, and are distributed to the diaphragm, and appear chiefly on its lower side, one to the right hand, the other to the left. The right vein is more backward and lower than the left. The left is distributed partly to the pericardium, and partly to the diaphragm, and sometimes branches to the capsulæ renales.

Q. What are the nerves of the thorax?

A. The twelve pair of dorsal or costal nerves, which all communicate with one another, as soon as they make their way out betwixt the vertebræ; each of them gives a posterior branch to the muscoli erectores trunci corporis; the first after having sent off the brachial nerve, already described, is, after the same manner with the succeeding eight, bestowed on the pleura and intercostal muscles; the tenth and eleventh are most of them sent to the abdominal muscles; the

the twelfth communicates with the first lumbar, and is bestowed on the musculus quadratus lumbalis and iliacus internus.

Q. What are the glands of the thorax ?

A. The glands of the thorax are the glandulæ bronchiales, the thymus, and dorsalis. Besides these, the œsophagus has a great number of glands, (especially towards its upper part) as before observed.

Q. Which are the glandulæ bronchiales.

A. The glandulæ bronchiales are very observable glands, situated externally in the larger divisions of the trachea and bronchia. They are of a blackish colour, and their use, like that of many others of the glands of this part of the body, is yet very little known.

Q. Which is the glandula dorsalis ?

A. The glandula dorsalis is a remarkable gland sometimes found in the thorax, about the fifth vertebra of the back, adhering to the posterior part of the œsophagus. It is in different subjects of various sizes ; being often of the size of a kidney bean ; sometimes of that of an almond, and sometimes considerably larger ; in others, it is much less than the smaller, and sometimes it is wholly wanting, or at least so extremely minute, and inconsiderable, that the best dissectors are not able to find it. Sometimes also two glands are found in this part in the place of one.

Q. Which is the glandula thymus ?

A. The thymus is a gland which in infants is very remarkable ; it is situated in the upper part of the thorax, immediately under the sternum

num, and lies upon the pericardium, and on the trunk of the aorta, and of the vena cava. It extends itself from the pericardium along the trunk of the aorta, to the beginning of the carotids, sometimes so far as to the thyroide gland; its figure is irregular and uncertain; its colour in infants is a pale red; in adults, it is of a duskier hue: it is much larger in infants newly born, than in subjects at a more advanced period. Its length in the former is no less than three fingers breadth, and its diameter two; its thickness is about half a finger; it gradually decreases from this size as the child grows up; in adults it is very small, and in old people it entirely disappears. Its substance is glandular and conglomerate; and it is surrounded by a membrane; it has blood vessels of the same name; its lymphatics sometimes run to the thoracic duct, sometimes to the subclavian veins, and they have in general no valves. The nerves of the thymus are from the par vagum, or from the intercostals; there is sometimes a milky juice found in this gland in new-born subjects. It has no excretory duct hitherto discovered, and its use is therefore not certainly known: possibly, according to Heister, it serves to secrete lymph, which it discharges into the thoracic duct, for the dilution of the blood and of the chyle, as the glands of the mesentery and of the pancreas do, in regard to the chyle. On this supposition, its use is much greater in the fœtus, than at any time after the birth, because the want of respiration in that state may well be sup-

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posed to subject the blood to be thicker, and to need more dilution than afterwards; nothing tending to attenuate the blood so much as respiration.

Q. What are the *mammæ* or breasts?

A. The *mammæ* or breasts, are two glandular bodies, of a roundish oval figure, situated on the anterior, and a little towards the lateral parts of the thorax; these are most remarkable in women. They differ in size according to age and sex; in very young and very old people they are always small, also in virgins and males of all ages: but in women with child, or those who give suck, they are generally large, often very enormous. In children of both sexes, and in males of all ages, they are commonly no more than cutaneous tubercles or soft *verucæ*, of a reddish colour, called *papillæ*, or nipples; each of them being surrounded by a small thin and pretty broad circle, or disk, more or less of a brownish colour, and an uneven surface termed *areola*. The time of the breasts growing full in women, is about the age of fourteen, or that of puberty, which is sometimes sooner, sometimes later; and the most natural time of their decreasing is about the forty-seventh, or fiftieth year, when their menses totally cease, and the breasts become flabby, losing their natural consistence and solidity. The breasts, besides the common integuments of the body, (already mentioned in the beginning of this work) are composed of a glandular substance, and a multitude of lactiferous ducts,

ducts, or small tubes, which unite by frequent anastomoses, and, as they approach the nipples, join and unite together, till at last they form seven, eight, or more small pipes, called tubuli lactiferi, which have several cross canals, by which they communicate with each other; so that if any of them be obstructed, the milk which was brought to it might not stagnate, but pass through by the other pipes, which all terminate in the extremity of the nipple. The substance of the nipple is cavernous, almost like that of the human penis. The excretory ducts or tubes are larger in women who give suck, and are dilated into sinuses, in many places forming a kind of cells, which hold the secreted milk, and communicate with the veins and arteries. All these parts are to be seen much more distinctly in breasts that are large and full of milk than in others; in young women, indeed, they are scarce to be distinguished at all; as also in such as have little breasts, in such as are emaciated, and in those of very old people.

This glandular substance of the breasts is seated in, and surrounded by a great quantity of fat; which makes by much the greater part of the breasts. The arteries and veins of the breasts are called mammary vessels, and are sent from the subclavian and axillary vessels. The nerves are from the dorsal ones of the spinal marrow. A fulness of the breasts, especially if there be milk found in them, is generally judged a mark of the loss of virginity,

ginity, and a proof that a woman has been with child; but this is not an infallible sign.

The swelling of the breasts during the time of gestation, is owing to the consent between the breasts and the uterus; there being so near a communication between the mammary vessels and the hypogastric vessels of the womb, that a dilation of the latter is attended with a similar one in the former: for the tubes which compose the glandular substance of the breasts in maids, like a sphincter muscle, contract so closely, that no part of the blood can enter them; but when the womb grows big with a foetus, and compresses the descending trunk of the aorta, the blood flows in a greater quantity, and with a greater force, through the arteries of the breasts, and forces a passage into their glands, which being at first narrow, admit only of a thin water; but growing wider by degrees, as the womb grows bigger, the glands receive a thick serum; and after birth they run with a thick milk, because the blood, which before flowed to the foetus, and for three or four days afterwards by the uterus, beginning then to stop, dilates the mammillary glands, and consequently swells the breast.

D I A L O G U E V.

OF THE ABDOMEN AND ITS PARTS.

Q. WHAT is the abdomen?

A. The abdomen begins immediately under the thorax, and terminates at the bottom of the pelvis of the *ossa innominata*. Its circumference or outer surface is divided into regions, of which there are three anterior; viz. the epigastric, or superior region; the umbilical, or middle region; and the hypogastric or lower region. There is but one posterior region, named *regio lumbaris*.

Q. Where is the epigastric region situated?

A. The epigastric region begins immediately under the appendix *eniformis*, at a small superficial depression, called the pit of the stomach, and in adult subjects ends above the navel in a transverse line from the last false ribs on each side. This region is subdivided in three parts, one middle, named epigastrium, and two lateral, termed hypochondria. The epigastrium takes in all that space which lies between the false ribs of both sides, and the hypocondria are the places covered by the false ribs.

Q. Where is the umbilical region situated?

A. The umbilical region being in adults, above the navel from the transverse line, where the epigastric ends, and ends below the navel at another transverse line, supposed to be drawn

parallel to the former, between the two *cristæ* of the *ossa ilium*. This region is likewise divided into three parts, one middle, which is properly the *regio umbilicalis*, and two lateral, called *ilia*, or the flanks; and they comprehend the space between the false ribs and upper part of the *os ilium* on each side.

Q. Where is the *hypogastric* region?

A. The *hypogastric* region is extended downward from the inferior limit of the *umbilical* region, and is also divided into three parts, one middle called *pubis*; and two lateral, called *inguina*, or the groins.

Q. Where is the *lumbar* region situated?

A. The *lumbar* region is the posterior part of the abdomen, and comprehends all that space which reaches from the lowest ribs on each side, and the last vertebra of the back, to the *os sacrum*, and neighbouring parts of the *ossa ilium*. The lateral parts of this region are termed the loins, but the middle part has no proper name in men.

The bottom of the abdomen, which answers to the pelvis of the skeleton, is termed anteriorly by the *pudenda*, or parts of generation, and posteriorly by the buttocks and anus. The buttocks are separated by *fossæ*, which lead to the anus, and each buttock is terminated downward by a large fold, which distinguishes it from the rest of the thigh. This *lumbar* region takes in likewise the *musculus quadratus lumborum* on each side, the lower portions of the *sacro lumbares* of the *longissimi dorsi*, *sacrer*, &c. The space between the anus and the parts of generation

generation is called perinæum, and is divided into two equal lateral parts by a very distinct line, which is longer in males than in females, (as I shall make appear hereafter.) The cavity of the abdomen, formed by the parts already mentioned, is lined on the inside by a particular membrane called peritonæum. The cavity of the abdomen is separated from the cavity of the thorax by the diaphragm, and terminated below by the muscoli levatores ani. This cavity of the abdomen contains the stomach and the intestines, which are commonly divided into three small parts, named duodenum, jejunum, and ilium; and three large, called cæcum, colon, and rectum. It contains likewise the mesentery, mesocolon, omentum, liver, gall, bladder, spleen, pancreas, glands of the mesentery, vasa lactea, receptaculum chyli, kidneys, renal glands, ureters, bladder, and the internal parts of generation in both sexes. Also the following bones, pertaining to this lower venter, viz. the five vertebræ of the loins, os sacrum, os coccygis, and ossa innominata, which contain the ilium, ischium, and pubis. These bones, below the vertebra, form the pelvis or basin, which is much larger in women than in men, to give room for the growth, &c. of the fœtus. The external parts of generation also belong to the abdomen, but I shall describe them hereafter.

Q. What are the bones pertaining to the abdomen?

A. The bones belonging to the abdomen are the vertebræ of the loins, which are the

five lowermost vertebræ of the spine or backbone, and complete the whole twenty-four: (see those of the neck and thorax before described.) The os sacrum, os coccygis, ossa innominata or pube, which consists of the ilium, ischium, and pubis.

Q. Does the five vertebræ of the loins differ from those of the neck and thorax which you have already described, page 111 and 135?

A. Yes. The five vertebræ of the loins differ from the rest in this, that they are the broadest, and the last of them is the largest of the vertebræ. Their acute processes are broader, shorter, and wider from one another, their transverse longer to support the bowels and muscles of the back; they are not perforated as those of the neck, nor have they a dimple or sinus as those of the back. The cartilages which are betwixt their bodies are thicker than any of the rest. The greatest motion of the back is performed by the vertebræ of the loins, because their cartilages are thicker, and their acute processes are at a greater distance from one another; for the thicker the cartilages are, the more we may bend our body forwards; and the greater distance there is betwixt the acute processes, the more we may bend ourselves backwards.

Q. Which is the os sacrum?

A. The os sacrum is the lower extremity of the spina dorsi, the vertebræ of which grow so close together in adults, as that they make but one large and solid bone of a triangular figure, whose basis is tied to the last vertebræ of the loins,

loins, and the upper part of its sides to the ilia, and its point to the os coccygis. This bone in infants is almost entirely cartilaginous; and in children more grown up, it always consists of several pieces, the junctures of four or five of which may be seen even in adults, although it be one continued bone. It has four or five holes on each side, which give passage to the nerves of the intestinum rectum, bladder, and parts of generation, and to the large crural and ischiatic ones: The uses of this bone, are to serve as a basis for the spine; to form the pelvis along with the ossa innominata, and to defend the parts contained in it; to serve as a place of origin to many of the muscles; to contain in its canal or sinus, the lower part or end of the spinal marrow, called cauda equina; and likewise to give passage to the nerves above mentioned.

Q. Which is the os coccygis?

A. The os coccygis is joined to the extremity of the os sacrum, and is composed of three or four bones; (but sometimes all the pieces are entirely cemented together,) the lower piece is still less than the upper, till the last ends in a small cartilage, which resembles a little tail turned inward. Its use is to sustain the rectum intestinum; it yields to the pressure of the foetus in women in travail, and midwives sometimes thrust it rudely and violently backwards, which occasions great pain and several bad effects.

Q. Which are the ossa innominata?

A. The

A. The ossa innominata are composed of three bones in young subjects, each of which has its peculiar name; the upper one is called the ilium, (the intestinum ilium lying between it and its fellow,) the anterior one the os pubis, and the lower and posterior one the os ischium. The ossa innominata are joined on each side, in the hinder parts of the os sacrum, forming a very firm and strong, though somewhat moveable, articulation with it; and with this bone they also form the cavity called the pelvis. The use of these bones is to support and sustain the spina dorsi, and indeed all the parts above them; to make a firm and proper juncture of the other parts of the body with the thighs; to serve for the place of origin to several muscles; to form the cavity of the pelvis, and to defend its contents from external injuries.

In the centre of these bones is the acetabulum coxendicis, or sockets for the thigh-bone; in the bottom of which sockets is another cavity, in which lies the mucilaginous gland of this joint. When imposthumations happen in this joint, they usually cause a great swelling and lameness in the hip, which in time makes a collection of matter in the external part of the hip, &c.

Q. What are the cartilages pertaining to the bones of the abdomen, besides those of the vertebræ already mentioned?

A. The true cartilages of the ossa innominata in adult subjects, are five in number, three common and two proper. The first and principal common cartilage is that which makes the symphisis

symphysis of the ossa pubis; the two other common cartilages join the ossa ilium to the os sacrum, but are thinner than that of the ossa pubis. The proper cartilages are those that line the cotyloide cavities, and except the notches and depressions in these cavities, all the rest of the surface of the acetabulum coxendicis is covered with a very white shining smooth cartilage.

Q. What are the ligaments of the bones pertaining to the abdomen, besides those of the vertebræ already mentioned?

A. The ligaments of the ossa innominata are also of two kinds, common and proper. The common are those which go between these and the neighbouring bones, of which there is a considerable number. To these must be added the ligaments by which the os femoris is joined to the os innominatum, which I shall describe hereafter among the other ligaments of the thigh. The principal proper ligaments are four in number, two called sacro-sciatic, one broad and external, the other small and internal, one obturator, and one inguinal. The broad sacro-sciatic or internal sciatic ligament proceeds from the inside of the spine of the crista of the os ilium to the false transverse apophyses of the os sacrum and the spine of the ischium. The internal sciatic ligament adheres closely to the inside of the posterior portion of the former, going from the fourth false transverse apophysis of the os sacrum, all the way to the upper part of the os coccygis. The obturator ligament fills up all the great foramen ovale, except the oblique

lique notch at its proper part, from which there is a transverse ligament to the inside of the upper and anterior part of the os pubis. The inguinal ligament, called from the discoverer ligamentum Fallopii, is an aponeurotic or ligamentary band, fastened by one end to the anterior and superior spine of the os ilium, and by the other to the spine of the os pubis. Another ligament runs transversely between the two angles of the cotyloide notch.

Q. Where is the mucilaginous gland belonging to the os innominata situated?

A. The rough unequal depression at the bottom of the acetabulum, or socket for the thigh-bone, is filled by a broad flat mucilaginous gland, bordered with a fatty substance, and covered by a fine membrane, through which a mucilaginous liquor passes to moisten the joint, and facilitate its motions. This membrane rises above the gland, and gives a sort of covering or coat to the ligament contained in the joint; the blood vessels of the gland pass between the bottom of the cotyloide notch, and the transverse ligament thereof.

Q. What are the mucilaginous glands of the joints?

A. The mucilaginous glands of the joints, where the bones are furnished with a cartilage, are small glands which furnish every joint for a sliding motion, with a mucilaginous matter, for lubricating the ends of the bones, that they may move easily upon one another; and that there may be no waste of this necessary fluid, it is contained in the investing ligaments; which
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for this very reason are no where divided, except to communicate with the ligaments of the tendons. These glands are generally seated in a little fat, near the insertion of the ligaments, that they may be compressed by them when the joints are in motion, which is a proper time to have their fluid pressed out. The most considerable parcel of these glands with their fat, are seen in the joint of the knee, and the largest gland of this sort is found in the sinus, at the bottom of the acetabulum of the os innominatum, and is compressed by the ligamentum teres.

The diseases of the joints either happen from ulcers in the mucilaginous glands, when pouring out matter that cannot be discharged, and foul the ends of the bones, or else from swellings in the ends of the respective ones. Either of these in time create excessive pain, which appears to be chiefly in the ligaments of the joints, notwithstanding what has been said of the insensibility of these parts. When a joint is much swelled and painful, without external inflammation, it is vulgarly called a white swelling, and more properly than a *spina ventosa*. It is sometimes in the beginning cured by evacuations, but when the limb wastes below the swelling, and the fingers or toes of the limbs grow thinner at their joints, and lose their shape, the case is absolutely irrecoverable. Sometimes the ends of the bones erode, then join together, and form an *anchylosis*, which, though a severe disease of itself, yet proves often the remedy of a much worse. In like manner, the bones of the hands

hands and feet, when they are ulcerated, sometimes unite, and are thus preserved from total ruin. But there is one case of a white swelling that is amazing, when the pain is so great that we are obliged to take off the limb, and yet neither find upon dissection, the ligaments or glands diseased, matter in the joints, the bones carious, nor any diseased appearance, except that the ends of the bones are a little larger and softer.

Q. What are the muscles of the abdomen?

A. The muscles peculiar to the abdomen only are five pair, (exclusive of the diaphragma and triangularis sterni, already spoken of, with the muscles of the thorax) viz. obliquus ascendens vel internus, obliquus descendens vel externus, pyramidalis, rectus abdominus, and transversalis abdominis. To these we may add those of the genital parts, anus and perinæum, viz. cremaster testis, erector penis, accelerator urinæ, transversalis penis, sphincter vesicæ urinariæ, detrusor urinæ, erector clitoridis, sphincter vaginæ, sphincter ani, elevator ani, intertransversales lumborum, psoas parvus, quadratus lumborum and coccygei.

Q. Which is the obliquus descendens muscle?

A. The obliquus descendens vel externus arises from the eight inferior ribs, at a little distance from their cartilages: it always intermixes, in a serrated manner, with portions of the serratus major atticus; and generally coheres to the pectoralis major, intercostals and latissimus dorsi; which last covers the edge of a portion of it, extended

tended from the last rib to the spine of the os ilium. From these origins the fibres run down obliquely forwards, and terminate in a thin, broad tendon, whose fibres are continued in the same direction. It is inserted under the whole length of the linea alba; (which is a strong tendinous line extended from the os pubis to the sternum, between the muscoli recti,) becomes thicker towards the lower part of the abdomen, and is perforated in the middle by the umbilicus, or the outside of the rectus muscle; the tendon of this external oblique muscle is connected with the tendons of the internal oblique and transverse muscles. The under part of the tendon divides into two columns, which leaves an oval space between them, named the ring of the external oblique muscle, for the passage of the spermatic cord in the male, or the round ligament of the womb in the female. The anterior superior column passes over the cartilage between the ossa pubis, and is fixed to the opposite os pubis; the other is fixed to the os pubis of the same side. It is also inserted, tendinous and fleshy, into the middle of the spine of the ilium. From that part, which is named its anterior superior spinous process, it is stretched tendinous to the os pubis, and is named Poupart's or Fallopius's ligament. From this ligament it sends a tendinous layer, which is lost in the membranous fascia of the thigh.

N. B. Poupart's or Fallopius's ligament is the inferior part of the tendon of the external oblique, extending from the anterior superior spinous process of the ilium, to the os pubis, where

where it is thickest, in order to strengthen the inferior part of the abdomen: here it is not inserted into any bone, but passes over the blood vessels of the inferior extremity.

Q. Which is the obliquus ascendens?

A. The obliquus ascendens vel internus arises from the spine of the ilium, the whole length between the posterior and superior anterior spinous process; from the os sacrum, and the three undermost lumbar vertebræ, by a tendon common to it and to the serratus posticus inferior muscle; from Poupart's ligament, at the middle of which it sends off the beginning of the cremaster muscle, and the spermatic cord in the male, or round ligament of the womb in the female, passes under its thin edge, except a few detached fibres. It is inserted into the cartilage ensiformis, into the cartilages of the seventh, and those of all the false ribs; but at the upper part it is extremely thin, resembling a cellular membrane, and only becomes fleshy at the cartilage of the tenth rib; here its tendon divides into two layers, which join the tendon of the external oblique, and runs over the rectus, to be inserted in the whole length of the linea alba; at its undermost part it is inserted into the fore part of the os pubis.

Q. Which is the pyramidalis?

A. The pyramidalis is a small muscle lying in the lower part of the rectus. It has the name from its figure, and its origin from the margin of the os pubis, with a broad fleshy head, but ends in a small round tendon in the linea alba, about three or four inches below the navel. This
muscle

muscle is sometimes double and sometimes single, and sometimes they are both wanting.

Q. Which is the rectus abdominis?

A. The rectus abdominis, arises from the sternum near the cartilago ensiformis, and the extremity of the two last ribs. It goes straight down to the fore part of the abdomen, and is inserted in the os pubis.

Q. What is the transversalis abdominis?

A. The transversalis abdominis arises tendinous, but soon becoming fleshy from the inner or back part of the cartilages of the seven lower ribs, where some of its fibres are continued with those of the diaphragm and the intercostal muscles, by a broad thin tendon, connected to the transverse processes of the last vertebra of the back, and the four superior vertebræ of the loins; fleshy, from the whole spine of the os ilium internally, and from the tendon of the external oblique muscle, where it intermixes with some fibres of the internal oblique; it is inserted into the cartilago ensiformis, and into the whole length of the linea alba, excepting its lowermost part. The spermatic cord runs under the lower edge.

The use of these abdominal muscles are to sustain the viscera of the abdomen, and to compress the parts contained therein, in order to clear it of what ought to pass off by the natural outlets, to relieve the stomach by vomiting, from whatever might be hurtful to it; and, lastly, to drive out by a violent expiration whatever may incommode the organs contained in the thorax. The obliquus descendens on the

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right side, and ascendens on the left, acting together, turn the upper part of the trunk of the body towards the left, and vice versa; but the trunk is chiefly turned upon the thighs; the recti, bend the body forward, and pull the sternum downward in expiration; the external oblique muscles on each side near the groins, are perforated to let through the processus vaginalis with the spermatic vessels. These perforations are distant from each other, so as to suffer the vessels to descend conveniently into the scrotum: this way the intestines or the omentum descend in ruptures.

Q. Which is the cremaster testis?

A. The cremaster testis muscle is so named, because (with its fellow) it suspends the testicles, and draws them up in the act of generation: it arises from the os ilium, and upper part of the ligamentum pubis, and almost encompassing the process of the peritonæum (which surrounds the spermatic vessels as they come out of the abdomen) descends with it, and is inserted into the tunica vaginalis, upon which it is spread in several distinct portions.

Q. Which is the erector penis?

A. The erector penis and its fellow serve for the erection of the penis. These arise on each side from the ossa ischii, and each of them is inserted into the corpus cavernosum of the same side. These muscles, when they act together, press the veins of the back of the penis against the os pubis, by which they prevent the reflux of blood from the penis; and consequently when at the same time the blood flows impetuously
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into the part by the arteries, and cannot get back this way, the penis becomes extended and erect.

Q. Which is the accelerator urinæ?

A. The accelerator urinæ arises tendinous from the ossa ischia, and fleshy from the sphincter ani, and being extended over the bulb of the urethra, afterwards divides, and is inserted into the penis. The use of this muscle is not to accelerate the urine, for that is propelled by the detrusor urinæ, or muscular coat of the bladder, but to protrude the semen, which is done only by this. They likewise assist the erectores in the erection of the penis, by driving the blood contained in the cavernous body of the urethra towards the glands, which is thereby distended; the tumefaction of these muscles at the same time compressing the veins that carry off the reflux blood from the corpus cavernosum.

Q. Which is the transversalis penis?

A. The transversalis penis vel perinæi, is one of the dilators of the urethra, arising from the tubercle of the os ischium on each side, and inserted into the posterior part of the bulb of the urethra. These muscles, however, are not quite determinate and certain in their origin or insertion, and sometimes they are wholly wanting. When they act, they dilate the urethra in its posterior parts.

Q. Which is the sphincter vesicæ urinariæ?

A. The sphincter vesicæ urinariæ is composed of transverse fibres, which form a circle round the neck of the bladder, serving to close it, to prevent the involuntary discharge of the

urine. In men this muscle is connected to the fibres of the intestinum rectum, and in women to those of the vagina.

Q. Which is the detrusor urinæ.

A. The detrusor urinæ is the muscular coat of the bladder, its fibres terminate in the sphincter vesicæ, whereby it not only presses the urine forward, but, when the bladder is full, becomes an antagonist to the sphincter, acting almost at right angles.

Q. Which is the erector clitoridis?

A. The erector clitoridis arises from the ischium, and is inserted into the corpora cavernosa of the clitoris, like the erector penis in men, and is said to cause erection in the same manner.

Q. Which is the sphincter vaginæ?

A. The sphincter vaginæ arises from the sphincter ani, and surrounds the orifice of the vaginæ; after which it is inserted under the crura of the clitoris. Its use is to constrict the orifice of the vagina, to press out a liquor from the glands of the vagina, and embrace the penis in coition.

Q. Which is the sphincter ani?

A. The sphincter ani is a muscle near two inches broad, composed of circular fibres, which closes the extremity of the intestinum rectum, and forms the anus. It is connected forward with the accelerator urinæ in men, and with the neck of the uterus in women, and backwards with the os coccygis. This muscle surrounds the anus to close it, and to prevent involuntary falling out of the fæces.

Q. Which

Q. Which is the elevator ani?

A. The elevator ani arises from the ossa ischii, pubis, and sacrum, within the pelvis, and is inserted round the lower end of the intestinum rectum. It surrounds also the collum vesicæ, glandulæ prostaticæ, and vesiculæ seminales in men, and the vagina in women. The use of this muscle, is to sustain and elevate the anus, lest the fæces should be burthensome to the sphincter; and to press the prostaticæ and vesiculæ seminales, in order to promote the emission of the seminal juices in coition.

Fistulæ in ano, that are within this muscle, generally run in the direction of the gut, and may be laid open into the gut with great safety; but those fistulæ, or rather abscesses, that are frequently formed on the outside of the sphincter, and usually surround it, all but where this muscle is connected to the penis, cannot be opened far into the gut, without totally dividing the sphincter, which authors say renders the sphincter ever after incapable of restraining the excrement: but this does not always hold true; for there have been many instances of the sphincter being divided, which made the patients unable to hold their excrements during the cure, but the wounds being healed, they have retained them as well as ever.

Q. Which are the intertransversales lumborum?

A. The intertransversales lumborum are small muscles, seated between all the transverse processes of the vertebræ lumborum, to bring them nearer together.

Q. Which is the psoas parvus?

A. The psoas parvus is one of the flexor muscles of the loins, which arises laterally from the body of the upper vertebra of the loins, and the last of the back, and is inserted into the os pubis, where it is joined to the ilium.

Q. Which is the quadratus lumborum?

A. The quadratus lumborum has its origin in the anterior and superior part of the posterior process of the ilium, and is inserted into all the transverse processes of the vertebræ of the loins, the last vertebra of the thorax, and the last rib. This, with its fellow, acting alternately, assist the extensor dorsi et lumborum in raising the ossa innominata in progression: or each acting singly, while the lower limbs are not moved, inclines the body to one side.

Q. Which are the coccygæi?

A. The coccygæi arise from the acute processes of the ossa ischii, and are inserted into the os coccygis, which they pull forward.

Q. What is the peritonæum?

A. This membrane is named peritonæum, from a Greek word, which signifies to be spread around. Having removed the muscles of the abdomen, the first thing we discover, is a very considerable membranous covering, which adheres immediately to the inner surface of the muscoli transversi, and of all the other parts of this cavity; and involves and invests all the viscera contained therein, as in a kind of bag. The peritonæum, in general, is a membrane of a pretty close texture, and yet very limber, and
capable

capable of a very great extension ; after which it can recover itself, and be contracted to its ordinary size, as we see in pregnancy, dropsies, corpulency, and repletion. It may be looked on as a single membranè, although it has been described by many anatomists, as a duplicature of two distinct membranous laminae ; but, properly speaking, the internal portion alone deserves the name of a membranous lamina, as being the main body of the peritonæum. The external portion may properly enough be termed the cellular substance of the peritonæum. The inner surface of the peritonæum is very smooth, and polished on that side which is turned to the cavity and viscera of the abdomen, and continually moistened by a serous fluid, discharged through almost imperceptible pores ; these pores may be seen by spreading a portion of the peritonæum on the end of the finger, and then pulling it very tight on all sides ; for then the pores are dilated, and small drops may be observed to run from them, even without a microscope. The sources of this fluid are chiefly from the exhalent vessels. The whitish corpuscles found in diseased subjects, are no proofs of the glands, which some anatomists place there in the natural state. The cellular substance, or external portion of the peritonæum adheres very closely to the parts which forms the insides of the cavity of the abdomen ; and it is not every where of an equal thickness ; in some places it is in a very small quantity, and scarcely any appears at the tendinous or aponeurotic portions of the musculi

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transverse, and on the lower side of the diaphragm; in all other places it is thicker, and forms cells, expanded into very fine laminæ, which, in diseased subjects, becomes sometimes so broad and thick, as to resemble so many distinct membranes. In some places this substance is every way like a *membrana adiposa*, being filled with fat, as round the kidneys, and along the fleshy portions of the transverse muscles, to which it adheres. It entirely surrounds some parts, as the bladder, ureters, kidneys, spermatic vessels, &c. and it is in these places improperly termed the duplicature of the peritonæum. Besides these differences in thickness, the cellular substance has several elongations, which have been called productions of the peritonæum. Two of these productions accompany and invest the spermatic ropes in males, and the vascular ropes, commonly called the round ligaments, in women. There are other two, which pass under the ligamentum Fallopii, with the crural vessels, which they involve; and they are gradually lost in their course downwards. To these four productions of the cellular substance of the peritonæum, we may add a fifth, which is spread on the neck of the bladder; and perhaps a sixth, which accompanies the *intestinum rectum*. All these elongations pass out of the cavity of the abdomen, and may be termed external, to distinguish them from others that remain in the abdomen, and are called internal. The great blood vessels, that is the aorta and vena cava, are likewise involved in this cellular substance of the peritonæum. In a word, it involves immediately and separately

separately all the parts and organs which are commonly said to lie in the duplicature of the peritonæum. The true lamina, or membranous portion of the peritonæum, is connected by the intervention of the cellular substance to the inner surface of the cavity of the abdomen; but it does not naturally accompany the external elongations of that substance. It only covers the origin or basis of these productions, without any alteration in its own surface at these places. It has, nevertheless, productions of its own, but they are very different from those of the cellular substance; for they run from without inward, that is, they run from the convex side of the great bag of the peritonæum into the cavity of that bag, some more, some less, and also in different manners, as if the sides of a large ball or bladder were thrust inward into the cavity of the ball or bladder. Of these internal elongations of the peritonæum, some are simply folded like a duplicature, some are expanded like inverted bags, or sacculi, to contain some viscus; some begin by a simple duplicature, and are afterwards expanded into a cavity, which contains some organ; some are alternately extended in the form of simple duplicatures and of cavities; and, lastly, some form only a small eminence on the inner surface of the great cavity of the peritonæum. Under the first species of these productions, we may bring the membranous ligaments of the abdomen, such as those of the liver, colon, &c. We see the second species in the external membrane of the liver; the third in the mesentery; the fourth in the mesocolon;

mesocolon; and the fifth at the kidneys and ureters. Besides the external productions of the cellular substance of the peritonæum, it has the same number of external elongations with the true lamina; which lie between all the duplicatures, and line the insides of all the cavities, or that side next the viscera contained in them.

The arteries and veins of the peritonæum are supplied from the epigastric, mammary, lumbar, and diaphragmatic vessels, and often from the spermatics. Its nerves are from those of the diaphragm, back, loins, and os sacrum. It has also a few lymphatics, which discharge themselves into the iliac glands.

The uses of the peritonæum are, to enclose the contents or viscera of the abdomen; for when it is dilated, wounded, or broken, they fall out of their proper places, and ruptures are formed. It also gives an external covering to almost all the parts contained in the abdomen, and forms the process of the peritonæum, and the tunica vaginalis of the testes.

The dropfy of the peritonæum may be distinguished by being least prominent about the navel, for there the tendons of the muscles and the peritonæum will not separate; and the water, in some that have been dissected, has been found to have made the parts where it was contained as foul as any ulcer; therefore none of them could have been cured by operation.

Q. What are the viscera of the abdomen?

A. The viscera of the abdomen, are the stomach, omentum, duodenum, jejunum, ilium, cæcum, colon, rectum, mesentery, mesocolon, liver, gall-bladder, porus biliaris, pancreas, spleen,

spleen, kidneys, renal glands, ureters and bladder; besides the vasa lactea, receptaculum chyli, and ductus thoracicus, already spoken of, and the urethra and internal and external parts of generation, which I shall hereafter describe.

A knowledge of the situation of these viscera, is often peculiarly advantageous to the medical practitioner. In new-born infants the distance between the sternum and the pelvis is near to a third of their whole length; in adults, the length of the abdomen does not extend to a fifth of the whole. In children of three feet in height, the abdomen measures nearly one foot, and it is not found to exceed that in adults five feet high. The abdomen may be considered as divided into three regions; in the superior are comprehended those parts that are bounded by the diaphragm and ribs, the middle extends from the ribs to the pelvis, and the inferior is constituted by the pelvis. The middle region in infants is not only much longer, but, in proportion, much more extensive in every respect than in people who have advanced to their full size. But though this middle region in infants is so large, the superior and inferior are very small in proportion to those of adults; so that in young children all the viscera of the lower belly are contained in its middle region, and remain there until, by degrees, they insinuate themselves into the other two regions as these become enlarged. At about the fifteenth year the situation of the viscera is entirely changed, and is as in the adult.

Q. What is the stomach?

A. The ventriculus or stomach, is a hollow
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membranous part, placed mostly in the left hypochondrium, immediately under the left side of the diaphragm, its left side touching the spleen, and its right covered by the thin edge of the liver.

The stomach in infants, instead of being situated transversely, as is the case in adults, hangs almost perpendicularly. It extends from the epigastric region, to the umbilical, inclining a very little to the left above, and to the right side below, having its convex side, or great curve, turned to the left, and the small curvature to the right. In consequence of this situation of the stomach, the omentum, which is always attached to its great curvature, lies more towards the left than the right side. From want of this circumstance being known, some have treated as diseases of the colon, such complaints in children, as on opening their bodies after death, have been found seated in the omentum only.

Its figure nearly resembles a pouch of a bagpipe, but its upper side is concave, and the lower convex; it has two orifices, both on its upper parts; the left, called cardia, is placed much higher than the right, continuous to the gullet, through which the aliment passes into the stomach; its right orifice is called the pylorus, through which the aliment is conveyed out of the stomach into the duodenum: in this part there is a circular valve which closes the stomach, and hinders a return of aliment out of the gut, but does not at all times hinder the gall from flowing into the stomach. The pylorus is connected

ned to the upper part of the stomach by a ligament. The size of the stomach in human subjects is various; in people addicted to gluttony it is usually very large; and in men it is generally larger than in women. Its vessels are arteries, veins, nerves, and lymphatics. The gastric arteries it receives from the cæliac; and the gastric veins all run to the vena portæ; among these are observable the vasa brevia, which go off to the splenic branch, and the vena coronaria, which surrounds the stomach. Its nerves principally enter at the left orifice; they come from the par vagum, and are very large, whence it is that the stomach is so sensible: the lymphatics go to the receptaculum chyli.

The substance of the stomach is membranaceous, and is composed of four coats, as the œsophagus. The first or external coat is membranous, the fibres of which run transversely; the second coat is muscular, whose fibres are chiefly longitudinal and circular; the third is nervous, this forms a multitude of wrinkles, and is furnished with a number of sanguiferous vessels, and small glands, which secrete a mucus; the fourth coat is thin, villose, and porous, and adheres very firmly to the former. As the muscular coat contracts, the inner coat falls into folds, which increase as the stomach lessens, and consequently retard the aliment most when the stomach is nearest being empty. The use of the stomach is for the digestion of our food, that is to receive, contain, dissolve, and change what is swallowed by the mouth; and after a sufficient concoction, to expel it
through

through the pylorus into the intestines: possibly it also absorbs, and retains the most subtle parts of what it has thus prepared for nutrition: but I shall speak more of this hereafter.

Q. What is the duodenum?

A. The *intestinum duodenum* is the first of the three small guts, so called from its being about twelve fingers breadth in length. It begins from the pylorus, from which turning downwards, it first passes by the gall bladder, and then under the jejunum and mesentery, and coming in sight again in the left hypochondrium, it there commences jejunum, which is the second of the small guts; but the place where this ends and the other begins, is not exactly determined. In infancy it is placed almost entirely behind the stomach. About four fingers breadth from the pylorus, it receives a duct from the liver and gall bladder, called *ductus communis choledochus*, and another from the pancreas, called *pancreaticus*, at a little distance from each other, which discharge their respective liquors into it. The coats of the duodenum are thicker than those of any other of the small guts, its cavity is also greater, and its passage in a straiter direction than any of them. The villi of the intestine are thicker than in the stomach; but the texture of them in man is not like hairs, as they are commonly represented in figures, but rather like that of a fungous glandulated substance, composed of an infinite number of very fine papillæ of different figures, in which we see, through a microscope, a multitude

titude of depressed points or pores, by which their whole surface seems to be pierced. Near its origin it has no valves, nor rugæ or wrinkles; but in its continuation it has very numerous and remarkable ones, called by authors *juga*. It has also the glands of Brunnerus in great number, which serve for the secreting of a thin aqueous fluid, and it receives an artery from the *cæliac* and a vein from the *aorta*.

Q. What is the *jejunum*?

A. The *jejunum* is so called from its being usually found empty, which is owing to the fluidity of the chyle, the greater stimulus of the bile in it, and the abundance of the *lacteal* vessels with which it is furnished. It is situated in the *regio umbilicalis*, and being the second of the small guts, it begins where the *duodenum* ends, and terminates where the valves are obliterated. Its length is different in various subjects; but is usually between thirteen and sixteen hands breadth long, making somewhat more than a third part of the small guts. It is distinguished from the *ilium* by its coats, which are a small matter thinner, and less pale; it receives arteries from the *mesentericæ*, and veins from the *mesaraicæ*, and has also a great many convinent glands and valves.

Q. What is the *ilium*?

A. The *ilium* is the continuation of the *jejunum*, and is the third and last of the small guts. It is situated in the *hypogastrium*, and very often some part of it in the *pelvis*, upon the bladder, especially in women; filling all the space between the *ilia*, whence its name.

Its

Its length is various, sometimes not more than fifteen, sometimes twenty-one hands breadth, or more. Its beginning is where the valves of the jejunum cease to be conspicuous, and its end is where the larger intestines begin; in which place, it is in a very singular manner inserted into the right side of the colon, near the upper edge of the os ilium. It has no other valves except that great one at the end which is called by many *valvula coli Bauhini*: its glands are, in general, more numerous towards the end than in any other part. The great length of the small guts is evidently for the convenience of a greater number of lacteals, that the chyle which misses the orifices in one place may not escape them in another. This intestine, because of its situation, falls easily down into the scrotum, by the production of the peritonæum.

Q. What are the thick and great guts?

A. The thick and great guts are the cæcum, colon, and rectum; but the cæcum here meant, is the head of the colon.

Q. What is the cæcum?

A. The cæcum, or *apendicula vermiformis*, is the only true cæcum, though the ancients describe it otherwise. It is situated on the beginning of the colon, and is properly an appendage of that gut. It is about four fingers breadth long, and the bigness of an earth-worm or goose quill, with a small orifice opening into the colon: this gut has seldom any thing in it. It is called cæcum, or blind, because it is open only at one end, by which it is fixed to the beginning of the colon; its other end,
which

which is shut, is not tied to the mesentery, but to the right kidney, by means of the peritonæum. In human subjects, the cæcum is called one of the large guts, though it is the smallest by far; this mistake is owing to the ancients taking their description of the viscera from dogs and some other animals in whom the cæcum is very large, as Chelselden and others observe.

Q. What is the colon?

A. The colon may be reckoned the first of the great guts, as I have before observed. It is the greatest and widest of all the intestines, and about eight or nine hands breadth long. It begins where the ilium ends, in the cavity of the os ilium, on the right side; from thence ascending by the kidney on the same side, it passes under the concave side of the liver, to which it is sometimes tied, as likewise to the gall-bladder, which tinges it yellow in that place; then it runs under the bottom of the stomach to the spleen, in the left side, to which it is also knit; from thence it turns down to the left kidney: and thence, passing in form of an S, it terminates in the upper part of the os sacrum, in the rectum. At the beginning of this gut, there is a valve formed by the production of the inmost coat of the intestines: in this place it hinders the excrements which are once fallen into the colon, from returning again to the ilium. It has a strong ligament, which, running along its upper side from the ilium to the rectum, strengthens it against the weight of the excrements, and draws it together into the cells, which, with the valvulæ conniventes, retards

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the passage of the excrements, that we may not be obliged continually to go to stool. The fleshy fibres of its second coat are greater and stronger than those of the other intestines, because greater strength is requisite to cause the excrements to ascend. The connivent valves are larger in this than in any other of the guts, as well as the coats stronger.

Q. What is the rectum?

A. The rectum is the last of all the intestines. It is about two hands breadth long, and three fingers breadth broad; it begins at the upper part of the os sacrum, where the colon ends, and going strait down (whence its name) it is tied to the extremities of the coccyx, by the peritonæum behind, and to the neck of the bladder in men, but in women to the vagina uteri before, from whence comes the sympathy between those parts. The coats of the rectum are more thick and fleshy than those of any other of the intestines: it has in general no valves, but several rugæ: the absence of valves here, is to prevent the expulsion of the fæces from being retarded. The extremity of this gut forms the anus. The figure of this intestine varies as it is full or empty: when empty, it is irregularly cylindrical, and sinks in by a kind of transverse folds; and in that state it is about three fingers breadth in diameter, more or less. When full it is wider, in proportion to the quantity of fæces, wind, or whatever else is contained in it; and it may be extended to the size of a large bladder, so as to represent a kind of stomach. The lower
end

end of this gut is the seat of the true fistula in ano, which usually runs betwixt the muscular coat and the inner coat; it is cured by opening it the whole length into the cavity of the gut; it is yet better, if it can be done, to extirpate all that is fistulous and schirrous. The other kind of fistula, improperly so called, is an abscess running round the outside of the sphincter, in the shape of a horse-shoe, being a circle all but where this muscle unites with those of the penis; this is best cured by opening and removing part of the outer skin. The former of these cases happens oftenest in full habits, proceeding frequently from the piles; the latter is generally a critical discharge, and one of nature's last efforts in consumptive and scorbutic habits of body. The inversion and sliding down of this gut is called prolapsus ani, a disease common in children, especially those who are afflicted with the stone, and not of much consequence; in men it is more rare and dangerous, being generally attended with a flux of humours. I have seen cases related of a prolapsus ani being cured by taking away a piece of the prolapsed gut with a caustic, lengthways of the gut; when the wound discharged the flux of the humours, the gut was easily reduced, and cicatrizing in that state, it never more fell down. Another, where a bold unthinking surgeon having cut off the prolapsed part, the cicatrix was so hard and contracted, that the patient could never after go to stool without a glyster, and then not without great misery. Oftentimes the piles occasion large tumours at the lower end of this gut:

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these

these are always best extirpated by ligature; for if they are cut, they will sometimes bleed excessively, and it is no easy matter to apply any thing to stop a flux of blood in that part. The guts have the same coats as the stomach, and the great guts have three membranes or ligaments, running on the outside their whole length, and supporting the sacculi into which those guts are divided. The lesser guts have at very small distances, semi-lunar valves, placed opposite to the interstices of each other, to prevent the aliment from passing too speedily through the guts; and the better to answer that end, they are larger and more numerous near the stomach, where the food is thinner, than they are towards the colon, where the food is continually made thicker in its progress by a discharge of part of the chyle. This contrivance, so necessary to men because of their erect posture, when they are obliged by sickness or accidents to lie along, becomes a great inconvenience, and calls for the help of glysters and purges. But brutes have not these valves, because they are not convenient in an horizontal posture. At the entrance of the ilium into the colon, are two very large valves, which effectually hinder the regress of the fæces into the ilium. Glysters, indeed, have been frequently known to pass them, and be vomited up; but the excrement that is sometimes vomited up, I am apt to think is such as had not passed into the great guts. The other valves in the colon are placed opposite, but not in the same place, to each other, and make with their anterior edges

edges an equilateral triangle; but as the gut approaches the anus, they become less remarkable, and fewer in number, as before observed. All the intestines have in their inner membrane an almost infinite number of very small glands; some of them in the large guts will appear to the naked eye when they are diseased. Their office is to discharge into the intestines, a liquor which serves for the attenuation of the chyle, for lubricating the intestines, and in the large guts, to soften the fæces, that they may be evacuated without pain. The use of the smaller guts is to promote the formation of the chyle, to perfect its secretions, and to propel the remaining fæces to the larger. The office of the larger guts is to receive and collect the matter of the fæces, and at a proper time to expel it. The length of the guts to that of the body is as five to one in a middle-sized man; in taller men the proportion is usually less, and in short men greater. The intestines have vessels in great abundance, running over every part of their substance. Their arteries are from the meseraic, serving for the smaller intestines, the lower for the larger; and these make a multitude of very singular and surprizing anastomoses. The veins are meseraics, and go off to the vena portæ and the liver. The nerves are sent from the intercostals, and the par vagum; besides these, we are to observe the lacteal vessels already described. The rectum receives blood-vessels also from the hypogastrics.

Q. What is the omentum?

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A. The

A. The omentum, epiploon, or caul, is a fine membrane larded with fat, somewhat like net-work. It is situate under the peritonæum, and immediately above the intestines on the surface of the small guts, and resembles an apron tucked up. Its outer or upper part, named *ala superior*, is connected to the bottom of the stomach, the spleen, and part of the *intestinum duodenum*; and thence descending a little lower than the navel, is reflected and tied to the *intestinum colon*, the spleen, and part of the *duodenum*; this last part is called *ala inferior*, and the space between the *alæ* is named *burfa*. Sometimes both *alæ* are tied to the liver, and in diseased bodies adheres to the peritonæum. The uses of the omentum are, to lubricate the intestines, that they may the easier perform their peristaltic motion, and to cherish and defend them from cold; to assist in the formation of the bile, the fatty part of which is wholly owing to the vessels of the omentum; every thing (according to Malpighi) that returns from this part going to the liver through adipose ducts to the *vena portæ*. It serves also to temperate the acrimony of the humours, and probably to give nourishment to the body, as all the other fat is supposed to do, when it is incapable of being nourished any other way. The arteries of the omentum come from the *cæliac*, and are very numerous; its veins arise chiefly from the splenic branch of the *vena portæ*, and its nerves are from the *intercostals* and *par vagum*.

Q. What is the mesentery?

A. The

A. The mesentery is a thick fat membrane, placed in the middle of the abdomen, or midst of the intestines, particularly of the smaller ones, whence it has the name. It is almost of a circular figure, with a narrow production, to which the end of the colon and beginning of the rectum are fastened. It is about four fingers in breadth, and half a hand's breadth in diameter; its circumference is full of plaits and foldings, and about three ells in length; the intestines are tied like a border on this circumference, so that to every inch of the mesentery, there are about three inches of the intestines fastened. Its substance is composed of membranes, fat, vessels of all kinds, and a number of glands. Its coats or membranes are two, and between these there is a cellular substance, which contains the fat: the meseraic vessels and glands are also placed there, which many reckon a third coat of the mesentery, and that not improperly; this they call the tunica cellulosa. In the upper part it is strongly fastened to the three superior vertebræ of the loins; and in the lower, with the intestines, and particularly with the jejunum and ilium. The vessels of the mesentery are blood-vessels, nerves, lacteals, and lymphatics. The blood-vessels are the same with those of the intestines, and these make a multitude of strange meanders, and have very frequent anastomoses. The nerves also come from the par vagum, and the intercostals. There are a number of glands dispersed throughout the whole mesentery, from which they take their name; these vary greatly in their size,

figure, and situation, in different subjects, and in old people they frequently almost disappear. The uses of the mesentery are to preserve the jejunum and ilium from twisting in their peristaltic or vermicular motion, and to confine the rest to their places, to sustain the sanguiferous and lacteal vessels of the intestines, and to make the way for the lacteals to the receptacle the shorter.

Q. What is the mesocolon?

A. The mesocolon is that part of the mesentery connected with the great guts, and especially the colon. The mesocolon meets the middle of the colon, to which it is joined. Its lower part sticks to a part of the rectum.

Q. What is the liver?

A. The liver is the largest gland in the body, of a dusky red colour, situated immediately under the diaphragm in the right hypochondrium. In infants it is large in proportion to its size in adults; and is situated almost entirely in the middle region of the abdomen; it appears to the touch externally, indeed, much nearer the linea alba than it is ever found to be in a more advanced age. Its figure is almost round, the upper surface convex, smooth, and equal; the lower, hollow and unequal; backward, towards the ribs it is thick, and thin on its fore part, where it covers the upper side of the stomach, and some of the guts. In its middle and fore part, it is divided into two by a fissure, where the umbilical vessels enter. It is fastened in the body by two ligaments; the first, which is large and strong, comes from the peritonæum
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that covers the diaphragm, to which the upper side of the liver adheres, and is thus tied to it and the sternum, being named *latum* or *susensorium*: the second is the umbilical vein, which after the birth degenerates into a ligament called *teres* or *umbilicale*; it is inserted at a small fissure in the lower edge of the liver. The *ligamentum latum vel susensorium*, sustains the liver in an erect posture, or rather fixes it in its situation, while it is supported by the other viscera, they being compressed by the abdominal muscles.

In lying down, the *teres* prevents it from pressing on the diaphragm; and in lying on the back, they both together suspend it, that it may not compress and obstruct the ascending *vena cava*. The vessels of the liver are very numerous, receiving arteries from the *cæliac* and *mesenterica superior*, called *arteriæ hepaticæ*; veins from the *vena cava*, and *vena portæ*; and nerves, from the *plexus hepaticus* of the intercostals. The biliary vessels are the *ductus choledochus communis*, which opens obliquely into the *duodenum*; the *ductus cysticus*, which runs from the gall-bladder to the common duct; the *ductus hepaticus*, which runs from the liver to the common duct; and the branches of this, distributed through the liver, make what are called *pori biliarii*. The liver has also a great number of lymphatics, most of which open near the *vena portæ*, or the concave side of the liver; from thence the lymph is carried by other lymphatics to the *receptaculum chyli*. To these vessels we may add the *canalis venosus*, and the great
sinus

sinus of the vena portæ, are accompanied in the liver with many small branches of the cæliac and meseraic arteries already mentioned. The vena portæ supplies the place of an artery, and brings the blood full of bile for secretion, which being strained off, the vena cava returns the blood which remains. The vena portæ and the cava, enter the liver by its concave side, and are equally distributed through all its substance; wherever there is a branch of the one, there is also a branch of the other.

There is one circumstance not much attended to with respect to the situation of the liver, viz. its large or right lobe occupies the whole half of the body where it lies, from the spine to the inside of the ribs, laying over the upper part of the kidneys; now this position of the liver is not often considered; for when any person hath a pain in the small of the back, they say very readily it is in the kidneys, but if it is a little higher up in their back, it is seldom if ever thought to be in the liver, though it most undoubtedly may, as its posterior edge lays in that part on the right side.

Q. What are the excretory ducts of the liver?

A. The excretory ducts of the liver are the vesicula fellis, and porus biliaris.

Q. What is the vesicula fellis?

A. The vesicula fellis, or gall-bladder, is a receptacle of bile, fastened to the concave part, or under side of the liver; its figure is like that of a pear, and, in general, of the size of a small hen's egg, though it differs in bigness in almost every

every person. When the liver is in its natural situation, the bottom, or largest part of the gall-bladder, is downwards, and the neck, or narrow part upwards; and then it touches the stomach as well as the colon, where it frequently dies them yellow. This bladder is composed of three membranes, or coats; the outermost is common to it with the liver, the next is muscular, and the third is nervous, covered with a kind of crust or mucus, which preserves it against the acrimony of the secreted bile, probably by some small glands, which Malpighi has remarked, between its coats, where the cystic arteries end. The bile is brought into the gall-bladder by some small vessels, which arise from the neighbouring glands, and which, uniting, form one or two pipes, which open at the neck of the bladder. These ducts are hard to discover in any liver except in that of an ox. From the neck of the gall-bladder there goes a pipe about the bigness of a goose-quill, called ductus cysticus, running towards the duodenum. Some small biliary ducts open likewise into it, and its inner membrane has several rugæ, which retard the motion of the bile. From the liver to this duct, runs one called hepaticus, which carries off the gall this way, when the gall-bladder is full; these two together make the ductus communis choledochus, which goeth obliquely to the duodenum, and enters that gut about four inches below its beginning. The gall-bladder has two veins from the vena portæ, which are called cysticæ gemellæ. It has some small arteries from the cæliaca dextra, and some lymphatics.

lymphatics. The use of the gall-bladder is to collect the bile; first secreted in the liver, and mixing it with its own peculiar produce, to perfect it farther, to retain it together a certain time, and then to expel it.

Q. What is the porus biliaris?

A. The porus biliaris is another excretory vessel of the liver; and, according to some, is the same with the ductus hepaticus: but I, as well as many others, make a distinction between them, and have already observed, that the hepatic duct runs from the liver to the ductus choledochus. The porus biliaris has as many branches as the vena portæ, which it accompanies through every part of the liver. Wherever there is a branch of the one, there is a branch of the other; and these two are inclosed in one common capsule, as in a sheath. The use of this capsule is to facilitate the motion of the blood and bile, by the contraction of its fibres. All these branches unite, and make one trunk, of the bigness of a small quill, which joins the end of the cystic duct, carrying the bile from the liver to the intestines, by the common duct, as was said before. The insertion of the porus biliaris into the cystic duct is oblique, with its mouth looking towards the ductus communis, by which means it is impossible that the bile, which comes from the cystis, can enter the porus biliaris, unless the common duct is stopped.

As the liver, from its situation in the same cavity with the stomach, will be most pressed, and consequently separate most gall when the

stomach is fullest, which is the time when it is most wanted; so the gall-bladder, being seated against the duodenum, will have its fluid pressed out by the passing through that gut, and consequently at a right time, and in due proportion; because the greater that quantity of aliment is, the greater will be the compression, and so the contrary.

There is no way of computing with any exactness, the quantity of bile that is usually secreted by the liver in a given time: but if it is four times as much as all the salivary glands secrete, it may be twenty-four ounces for every meal; to which being added six ounces of saliva, which appears to be a moderate computation, supposing the pancreas, in the same time, secretes three ounces, there will then be thirty-three ounces of fluids separated for the digestion of one meal; and that these necessary fluids may not be wasted in such quantities, they pass into the blood with the chyle, and may be soon separated again for the same use, and very likely some of the same bile may be employed more than once, for digesting part of the same meal. As the liver exceeds all the glands in the body in magnitude, and its excretory ducts ending in the duodenum, it seems to me to be much more capable of making those large separations from the blood, which are procured by cathartics, than the scarce visible glands of the guts. The liver ordinarily weighs, in a middle sized man, about three pounds twelve ounces: the pancreas, three ounces; and the spleen, fourteen ounces.

Q. What

Q. What is the pancreas?

A. The pancreas, commonly called the sweetbread, is a large gland of the salivary kind, lying across the upper and back part of the abdomen, near the duodenum, behind the stomach, and between the liver and spleen. Its length is eight or nine inches, its breadth about two fingers, or two and a half, its thickness about one finger, and its weight about three ounces, as before observed. The shape of the pancreas very much resembles the tongue of a dog; it is broadest towards the duodenum, and gradually narrower towards the spleen. It is surrounded with a membrane, which is continuous with the peritonæum; it has arteries from the cæliac and splenic branches, and veins also from the splenic vein; its nerves are from the par vagum and intercostals; and finally it has a short excretory duct, which is situated in the middle of the pancreas, where it resembles an empty vein, and is about the thickness of a very small straw. This duct terminates in the duodenum, which it enters obliquely, four or five fingers breadth below the pylorus, usually at the same orifice with the ductus choledochus, but sometimes it has a double aperture. The use of the pancreas is to secrete a particular liquor, called the pancreatic juice, which is of a salivose nature, and is carried by the pancreatic duct into the duodenum, where it serves to dilute the chyle, or render it more fluid and fit to enter the mouths of the lacteals; and, perhaps, to temper and dilute the bile, to change its viscosity, bitterness, colour, &c. and make it mix with the chyle, in
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order

order to assimilate the several tastes, odours and properties of the several foods, into one homogeneous one.

In those who die of the jaundice, for the most part, are found in the gall-bladder, and the biliary ducts, concretions of bile, so light as to swim in water, yet are called gall-stones: these cause the jaundice, by obstructing the ducts; many persons who have been cured of this disease have had great numbers of these stones found in their excrements.

Q. What is the spleen?

A. The spleen is a viscus of a deep blackish red colour, situated on the left side of the stomach, immediately under the diaphragm, near the ribs and above the left kidney. The spleen in infants is always easily discovered, by the touch, immediately below the false ribs; this, in adults, never can be done but in a diseased state of the viscus: in the former, a considerable part of it is situated in the middle region of the abdomen; whereas, in the latter, its seat is always in the left hypochondrium. The figure of it is a sort of depressed oval, near twice as long as broad, and almost twice as broad as thick. Its usual size is five or six inches long, three broad, and one inch thick; but this varies in different subjects. It is supported by the contained parts, and fixed to its place by an adhesion to the peritonæum and diaphragm; it is also connected with the stomach, by the vasa brevia, and with the pancreas, omentum, and left kidney, by membranes. The substance of the spleen is vascular and fibrose. There are two lymphatic glands

glands of about the bigness of a bean, situated without it, near where the vessels enter. The vessels of the spleen, considering its size, are remarkably large. Its artery is from the cæliac, and is called the splenic artery; the splenic vein is like those of the other viscera, very much ramified, and its branches are carried throughout the whole spleen; the nerves of the spleen are from the plexus splenicus: the spleen has no excretory duct; but there are in it lymphatic vessels running to the receptaculum chyli. The use of the spleen has been much controverted by authors; but the most probable seems to be, that it serves to render the blood more fluid, out of which the bile is afterwards to be secreted.

Q. What are the kidneys?

A. The kidneys are two dark red viscera of an oblong figure, resembling a large bean; situated one on each side the vertebræ of the loins, in the posterior part of the abdomen, upon the two last ribs. The right kidney lies under the great lobe of the liver, and is consequently lower than the left, which lies under the spleen; the concave side of the kidneys is turned inwards to the vertebra, and the convex side outward. The kidneys are connected with the loins, the lower ribs, the colon, glandulæ renales, the renal vessels, and the ureters. They have two membranes, the one common from the peritonæum, called the adipose membrane, from its being generally covered with much fat; this surrounds them but loosely, and is furnished with its own proper vessels. The other membrane is proper, is very thin, and every where applied closely to the
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The chyle is a white juice extracted from the aliment
and afterwards mixed with the blood after it has circulated
through the body fomented with heat and mixed with a
quantity of animal juices, it is at length so changed that a
part of it is deposited in the cellular substance under
the denomination of fat; a part of it is configured into the
red globules; another part changes into serum; and the
watery part goes off, in some measure by urine, in some
measure by perspiration; while a small part is returned
in the habit to dilute the blood it is extracted by the
lacteals which are at first formed of numerous small
radiated branches which afterwards unite in larger
and unite with the lymphatics in the ~~the~~ thoracic duct

the substance of the kidneys. The substance of the kidneys is firm and hard, and is of two kinds. The exterior, or cortical part, according to Malpighi, is glandular, but according to the discoveries of Ruysch, is throughout elegantly vascular. Or, as others observe, we may distinguish three kinds of substances in the kidneys; an exterior, which is thick, granulated, and in a manner cortical; a middle substance, which is medullary and radiated, called *friata sulcata*, or *tubularis*, because it seems to be made up of radicle tubes; and an inner substance, which is only a continuation of the second, and terminates on the inside by *papillæ*, for which reason it is called *papillaris*. The interior is tubulous, and expressed by the name of *tubuli urinarii Bellini*; these terminate in ten or twelve *papillæ*, which open by a multitude of apertures into the pelvis; but these *papillæ* are not found in all subjects. This length answer to the distance between the two last false ribs and the os ilium, which is generally about five or six fingers breadth; they are about half as broad as long, and about half as thick as broad. The vessels of the kidneys are like those of the liver, included in a membrane, from the peritonæum. The arteries and veins are large, and called *emulgents*, and *renal vessels*; these are produced from the aorta and vena cava: the nerves are from the *plexus renalis*, proceeding from the intercostals. There is also a number of lymphatics passing to the *receptaculum chyli*; and also an excretory duct, called the *ureter*, which I shall by and by describe. The use of the kidneys is to secrete

the urine from the blood, which is brought there for that purpose by the emulgent arteries; and what remains from the secretion, is returned by the emulgent veins, while the urine secreted is carried off through the ureters to the bladder.

Q. What are the *glandulæ renales*?

A. The *glandulæ renales*, called also *capsulæ atrabiliaræ*, and *renes succenturiati*, are two yellowish glands of a compressed figure, lying on each side of the upper part of the kidneys, a little above the emulgent vessels. They have a very narrow cavity imbued with a brownish liquor of a sweetish taste, and are about the bigness of a large *nux vomica* generally in adults; in the *fœtus* they are larger, and often exceed the kidneys themselves in size. The very thin membrane that surrounds them closely involves their whole substance, and connects them with the kidneys. They have blood vessels and nerves, and their lymphatic vessels are numerous.

Q. What are the ureters?

A. The ureters are tubes about the bigness of goose-quills, and about a foot long; they arise from the hollow side of the kidneys, and terminate in the urinary bladders near the neck. At their origin in the kidneys they are expanded into the form of a funnel, and this expansion makes the pelvis of the kidneys: at their termination in the bladder, they pass obliquely for the space of an inch between its coats, which manner of entering is to them as valves, for their orifices being narrow, will admit of nothing into them from the bladder. The ureters are not straight, but somewhat bent, so as to resemble the letter S.

Their

Their substance is membranous, and they are composed of three coats; the first is from the peritonæum; the second is a thin muscular one; and the third, a nervous one, covered with a slimy liquor to defend it against the acrimony of the urine; and in this, there are sometimes discovered glands; the blood vessels and nerves come from the adjacent parts. Such as are subject to the gravel, and are given to excess of drinking, have them sometimes so much dilated, that you may put the end of the little finger into them. Their use is to carry the urine from the kidneys to the bladder. Their obstruction causes a suppression of urine.

Q. Where is the bladder situated, and how composed?

A. The urinary bladder is seated in a duplicature of the peritonæum in the lower part of the pelvis; but in infants it is entirely above the pelvis; it is remarkably large in proportion to the other parts, and extends to within a very small distance of the navel; when full of urine it makes a very evident prominence near about the middle and inferior part of the abdomen. Its shape is orbicular, and its coats are the same with those of the guts already described, viz. an external, membranous, a middle muscular (which is the detrusor urinæ,) and an inner membranous or nervous coat, which is covered with a peculiar fluid of a mucous nature, secreted in glands situated in this coat, and principally in that part which is near the neck of the bladder. The coats of the bladder are much thinner in the body and the fundus (which is the bottom,

situated uppermost) than they are at the neck and lowest part. The sphincter, in the neck of the bladder, closes it, to prevent an involuntary discharge of urine. The bladder in adults will conveniently hold about a pint; but it is capable of distension so as to hold much more. It is connected in the human body, in a singular manner, by the peritonæum to the os pubis, different from other animals: it is also connected with the parts of generation by the urethra, with the navel by the urachus and umbilical arteries, and finally in men with the intestinum rectum, and in women with the vagina. The blood vessels of the bladder come from the hypogastric, the umbilical, and the hæmorrhoidal vessels in men; and in women from the spermatics also. Its nerves are from the intercostals, and principally from those of the os sacrum. The bladder has three foramina; two where the ureters enter in, at which the urine passes into the bladder; and one, much larger than these, in the neck, for the discharge of the urine into the urethra. The nervous or inner coat of the bladder is exceedingly sensible, as is miserably experienced in the stone and gravel.

Q: What are the arteries of the abdomen?

A. The arteries of the abdomen are various, and proceed from the aortā, already described. they take their names from the parts they are bestowed on, viz. arteriæ diaphragmaticæ vel phrenicæ, arteria cæliaca, ventriculi coronaria, hepatica, pylorica, gastrica, intestinalis, cysticæ biliaria, splenica, pancreaticæ, mesentericæ, hæmorrhoidalis,

hæmorrhoidalis, renales, capsulares, spermaticæ, lumbares, sacræ, iliacæ, hypogastrica, umbilicalis, glutæa, sciatica, pudicæ, and obturatorix.

Q. Which are the arteriæ diaphragmaticæ vel phrenicæ?

A. The arteriæ diaphragmaticæ, called also phrenicæ, arise from the aorta in two branches, as it passes under the diaphragm, which are ramified on the diaphragm, sometimes it arises from the cæliaca, and sometimes a trunk from each. They give small branches to the glandulæ renales, and membrana adiposa of the kidneys, the latter being called arteriæ adiposæ. Smaller diaphragmatic arteries come from the intercostals, mammariæ internæ, mediastinæ, pericardiæ, and cæliaca?

Q. Which is the arteria cæliaca?

A. The arteria cæliaca arises from the aorta descendens, immediately below the diaphragm, and is soon after branched out to the liver, pancreas, spleen, stomach, omentum, and duodenum, which branches are named from the parts they are bestowed on, except the ventriculi coronaria bestowed upon the stomach, and the branch upon the duodenum, named intestinalis.

Q. Which is the arteria ventriculi coronaria?

A. The arteria ventriculi coronaria, arises from the cæliaca, and is ramified on every part of the stomach, and sends off small branches to part of the liver, neighbouring parts of the diaphragm, and omentum.

Q. Which is the arteria hepatica?

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A. The

A. The hepatica arises also from the cæliaca, and goes to the pylorus with the vena portæ, sending off the pylorica and gastrica dextra, and is then ramified with the vena portæ through all the liver.

Q. Which is the arteria pylorica?

A. The pylorica arises from the hepatica, and is ramified on the pylorus and neighbouring parts of the stomach.

Q. Which is the arteria gastrica dextra?

A. The gastrica dextra, arises also from the hepatica, and passing behind and beyond the pylorus, sends off the duodenalis vel intestinalis, when it does not come from the hepatica; after this it runs along the right side of the great curvature of the stomach, and sends off branches to all the neighbouring parts on both sides, which communicate with those of the pylorica, coronaria ventriculi, and gastro-epiploicæ dextra, the latter furnishing the nearest parts of the omentum, and communicating with the mesenterica superior, at last the right gastric ends in the left, which is a branch of the splenica?

Q. Which is the duodenalis vel intestinalis?

A. The duodenal or intestinal artery runs along the duodenum on the side next the pancreas; to both of which it sends branches, and also to the neighbouring part of the stomach.

Q. Which is the cysticæ and biliaria?

A. The hepatic artery having sent out the pylorica and gastrica dextra, gives two branches to the vesicula fellea, called arteria cysticæ, and another named biliaria, which is lost in the great lobe of the liver. Afterwards, the hepatic

patic artery is ramified with the vena portæ through all the substance of the liver.

Q. Which is the arteria splenica ?

A. The splenica arises close by the hepatica, the hepatic branch going to the right, and the splenic to the left ; immediately after its origin from the cæliaca it runs toward the left under the stomach and pancreas to the spleen.

Q. Which are the pancreaticæ ?

A. The arteriæ pancreaticæ are branches of the splenica ramified on the pancreas.

Q. Which is the arteria gastrica sinistra ?

A. Under the left portion of the stomach it gives off a branch called gastrica sinistra, to the left side of the stomach, which communicates with those of the coronaria ventriculi. This gastric artery also supplies the omentum with branches, termed gastro-epiploicæ sinistræ, which communicate with the right gastric. By this account it appears that the coronaria ventriculi, pylorica, intestinalis, gastrica, gastro-epiploicæ and consequently the hepatica, splenica, and mesenterica, communicate all together. After this, before the splenica arrives at the spleen, it gives two or three branches to the large extremity of the stomach, commonly called vasa brevia ; and one to the omentum, named epiploica.

Q. Which is the mesenterica superior ?

A. The arteria mesenterica superior, arises anteriorly just below the cæliaca, and gives off branches to part of the pancreas and duodenum, communicating with the intestinalis ; then

going between the laminæ of the mesentery, and the duodenum and meseraic vein, it distributes a number of branches to the small intestines, from the lower third part of the duodenum, to the cæcum and colon. As they approach the intestines, all these branches communicate first by reciprocal arches; then by areolæ and the meshes of all kinds of figures, from which is detached an infinite number of small ramifications, which surround the intestinal canal like an annular piece of net-work.

Q. Which is the mesenterica inferior?

A. The mesenterica inferior arises anteriorly from the aorta descendens inferior, about an inch above the bifurcation, and below the spermatic arteries; soon after it sends branches to the colon and rectum, communicating with one another; it also sends off a branch called hæmorrhoidalis interna.

Q. How is the hæmorrhoidalis interna distributed?

A. The hæmorrhoidalis interna runs down behind the intestinum rectum, to which it is distributed by several ramifications, and communicates with the arteriæ hypogastricæ.

Q. Which are the arteriæ renales?

A. The renal arteries, commonly called emulgers, are commonly two in number, and go out laterally from the inferior descending aorta, immediately under the mesenterica superior, one to the right hand, the other to the left. They enter into the depressions of the kidneys by several branches, and are ramified through all the substance of the kidneys. Sometimes
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the renal arteries send branches to the glandulæ renales, membrana adiposa of the kidneys, and even to the diaphragm.

Q. What are the arteriæ capsulares?

A. The arteriæ capsulares are the arteries of the renal glands, which arise sometimes from the aorta, sometimes from the trunk of the cæliaca; but generally the right comes from the arteria renalis of the same side, near the origin, the left from the aorta above the renalis.

Q. Which are the arteriæ spermaticæ?

A. The arteriæ spermaticæ are commonly two in number, sometimes more; they are very small, and go out anteriorly from the aorta descendens inferior, near each other, about an inch below the renales, between the two mesentericæ, or between the renales and mesentericæ inferiores. They send off small branches to the common membrane of the kidneys, named adiposæ; and afterwards they run down upon the psoas muscles, on the foreside of the ureters, between the two laminæ of the peritonæum. They give several considerable branches to the peritonæum, chiefly to those parts of it which are next the mesentery, and they communicate both with the mesentericæ and adiposæ. They likewise send small arteries to the ureters. Afterwards, they pass in men through the tendinous openings of the rings of the abdominal muscles in the vagina of the peritonæum, (termed processus vaginalis) and are distributed to the testicles and epididymes, where they communicate with a branch of the iliaca externa. In women they do not go out of the abdomen, but are distributed

distributed to the ovaria and uterus, and communicate with branches of the hypogastrica, at the jagged extremities of the tubæ Fallopiæ.

Q. Which are the lumbar arteries?

A. The arteriæ lumbares, or lumbar arteries, go out posteriorly from the inferior descending aorta, in five or six pairs, or more, much in the same manner with the intercostals. The superior send small branches to the neighbouring parts of the diaphragm and intercostal muscles. They are distributed on each side to the psoas muscle, quadrati lumborum, and to the oblique and transverse muscles of the abdomen; and by perforating the oblique muscles they become external hypogastric arteries. They go likewise to the vertebral muscles and bodies of the vertebræ; and enter the spinal canal through the lateral notches, forming rings much in the same manner with the intercostals; and they likewise give small twigs to the nerves:

Q. Which are the arteriæ sacræ?

A. The arteriæ sacræ are generally two, three, or four in number, and sometimes but one. They go out commonly from the back part of the inferior descending aorta at the bifurcation, but sometimes from the lumbares, and sometimes from the iliacæ. These arteries are ramified on the os sacrum, and neighbouring parts of the peritonæum, intestinum rectum, fat, &c. They likewise send small arteries to the nerves which go through the holes of the os sacrum, and they penetrate the inner substance of that bone.

Q. Which

Q. Which are the arteriæ iliacæ ?

A. The arteriæ iliacæ are those two large lateral branches arising at the bifurcation, where the aorta descendens inferior ends at the last vertebra of the loins, and sometimes higher. They run obliquely toward the anterior and lower part of the ossa ilium, sending off a few very small arteries to the os sacrum, neighbouring muscles, &c. likewise small arteries to the peritonæum, coats of the veins, fat and ureters, behind which the iliac trunks pass about three fingers breadth from their origin, each iliac trunk is divided into two secondary arteries, one external, the other internal ; the former has no particular name, but the latter is termed hypogastrica.

Q. How is the external iliac distributed ?

A. The external iliac on each side runs down on the iliac muscle to the ligamentum Fallopii, under which it goes out of the abdomen, and as it passes under this ligament, it detaches two considerable branches one internal the other external. The internal branch is named epigastrica, and goes out anteriorly from the external iliac ; from thence it runs obliquely upward on the tendon of the transverse muscles, and to the posterior and inner part of the rectus muscle, sending ramifications to the tendons of the neighbouring muscles, &c. and afterwards communicating with the mammaria interna and intercostalis inferior. It sometimes gives out a branch accompanied by a nerve to the triceps, muscles, &c. through the foramen ovale. And another branch which runs down to the testicles

cles along with the spermatic artery, and there communicates with it. The outside branch of the external iliac divides in two at the internal labium of the os ilium, where it divides into two, and is ramified on the oblique and transverse muscles of the abdomen, communicating with the arteria lumbares. Besides these, a small twig goes off internally to the vagina of the spermatic rope, and sometimes another from the outside to the os ilium.

Q. How is the hypogastric or internal iliac artery distributed?

A. The hypogastric or internal iliac, having run about an inch and a half inward and backward, bends by degrees, and ends in the umbilical artery, which ought to be looked upon as a true continuation of the trunk of the hypogastric.

Q. How is the arteria umbilicalis distributed?

A. The umbilical artery (as above) ascends on the side of the bladder, and being ramified on that viscus, and the neighbouring parts of the peritonæum, &c. it contracts, and in adults is quite closed up above the middle of the bladder: it likewise gives branches to the uterus, and to the neighbouring parts in both sexes. Afterwards it ascends in form of a ligament to the umbilicus, its name being taken from its use in the foetus.

Q. Which is the arteria iliaca minor.

A. The iliaca minor arises from the convex side of the curvature of the hypogastrica, and is the most posterior branch: it passes between
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the two lumbar nerves, and divides into two; one branch goes to the canal of the os sacrum, the other to the iliac muscle, and inside of the os ilium, giving twigs as it passes to the psoas muscle.

Q. Which is the arteria glutæa?

A. The glutæa arises also from the convex side of the curvature of the hypogastric, is commonly very considerable, and sometimes the largest of all the hypogastric branches: this artery goes out of the pelvis in company with the sciatic nerve, through the upper part of the great sinus of the os innominatum, and is distributed to the glutæus maximus and medius. In its passage it gives branches to the os sacrum, os coccygis, musculus pyramidalis, muscles of the anus, and to the neighbouring parts of the intestinum rectum, (forming a particular hæmorrhoidalis interna) and to the bladder and parts near it, and a pretty long branch runs down with the sciatic nerve.

Q. Which is the arteria sciatica?

A. The arteria sciatica arises near the glutæa, and gives branches to the musculus pyramidalis, quadragemini, os sacrum, sciatic nerve, os ilium, os ischium, musculi glutæi, and a branch runs under the quadratus to the articulation of the os femoris.

Q. Which is the arteria pudica?

A. The pudica arises also from the convex side of the curvature of the hypogastric; and the first principal branch called commonly pudica interna, gives out two branches, the first
goes

goes through the great sinus of the os ilium with the glutæa and sciatica, and then divides into two, one branch goes behind the spine of the ischium all the way to the origin of the corpus cavernosum penis.

There it divides into several arteries; one goes to the sphincter ani, named hæmorrhoidalis externa; the rest are distributed to the neighbouring integuments, to the bulb of the urethra, and to the corpus cavernosum penis. The second principal branch, commonly called pudica externa, runs between the bladder and intestinum rectum, and in men is distributed to the vesiculæ seminales, neck of the bladder, prostata, and neighbouring part of the rectum; it then runs under the os pubis on the side of a considerable vein: and along the penis between this vein and a nerve, being distributed in its passage to the corpus cavernosum. Sometimes the pudica externa goes off separately from the hypogastrica, especially in women, being distributed to the uterus, (where it communicates with the spermatic artery) and to the neighbouring parts of the vagina, &c.

Q. Which is the arteria obturatrix?

A. The arteria obturatrix perforates the obturator muscles, from whence its name; it goes out of the pelvis at the upper part of the ligament of the foramen ovale, having first sent a small branch to the inguinal glands and integuments. In its passage it supplies the pectineus and triceps muscles, communicates with the sciatica, which goes to the articulation of the

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os femoris, and gives small arteries to the holes in the neck of that bone.

Q. What are the veins of the abdomen ?

A. The veins of the abdomen are numerous, and all proceed from the vena cava (the vena porta excepted) and chiefly from the vena cava inferior, which trunk, having run down about a quarter of an inch from the right auricle of the heart, within the pericardium (as I have already observed) pierces that membrane, and the tendinous portion of the diaphragm, which adheres very closely to each other ; at this place it gives off the venæ diaphragmaticæ or phrenicæ. In describing the veins, I shall begin by the great trunks, and end by the ramifications in the method I have before observed. The veins of the abdomen are, venæ diaphragmaticæ or phrenicæ, hepaticæ, cysticæ gemellæ, pylorica, gastrica dextra, coronaria ventriculi, duodenalis vel intestinalis, mesaraica, epiploica dextra, cæcalis, hæmorrhoidalis interna, splenica, pancreaticæ, gastrica sinistra, gastro-epiploica and epiploica sinistra, vasa brevia, venæ renales, capsulares et adiposæ, spermaticæ lumbares, bifurcatio ex vena cava, venâ sacra, venæ iliacæ, vena iliaca externa, epigastrica, hypogastrica vel iliaca interna, obturatrix, venæ hæmorrhoidales externæ.

Q. Which are the venæ-diaphragmaticæ vel phrenicæ ?

A. The venæ diaphragmaticæ, or phrenicæ, arise from the vena cava inferior, where they pierce the midriff, are distributed to the diaphragm, and partly to the pericardium ; and
sometimes

sometimes they send branches to the capsulæ renales much in the same manner as the arteriæ phrenicæ.

Q. Which are the venæ hepaticæ?

A. The vena portæ is a large vein, the trunk is situated chiefly between the eminences on the lower or concave side of the liver. It may be considered as made up of two large veins joined almost endways by their trunks, from each of which the branches go to the right and left; but first of all the trunk sends off the venæ cysticæ gemellæ, gastrica dextra, pylorica, ventriculi coronaria, duodenalis or intestinalis. The first portion of this trunk known by the name of vena portæ I have already spoken of. The other portion is the hepaticæ.

Q. Which are the venæ cysticæ gemellæ?

A. The cysticæ gemellæ run along the vesicula fellis from its neck to the bottom; they arise from the right side of the great trunk near its beginning.

Q. Which is the vena pylorica?

A. The pylorica arises from the great trunk, almost opposite to the origin of the cysticæ; but sometimes it is only a branch of the right gastrica: it supplies the stomach and omentum, and communicates with the gastrica, coronaria ventriculi, &c.

Q. Which is the vena coronaria ventriculi?

A. The coronaria ventriculi, so called because it surrounds more or less the upper orifice of the stomach; and in its passage forms numerous areolæ on the side of the stomach;
it

it communicates with the pylorica and the veins of the great arch.

Q. Which is the vena duodenalis?

A. The duodenalis vel intestinalis, goes out from the great trunk near the cysticæ gemellæ; It is distributed chiefly to the intestinum duodenum, but sends some branches to the pancreas.

Q. Which is the vena mesaraica?

A. The mesaraica arises from the trunk of the portæ near the pancreas, and turns to the right hand; it accompanies the superior mesenteric artery and mesocolon which belong to the small intestines, the cæcum, and right portion of the colon. One branch of the mesaraica runs directly to the middle of the colon, where it is arched to the right and left; another branch divides in two, and supplies the head of the pancreas and the neighbouring parts, and is arched on the right portion and upper part of the colon. See vena epiploica.

Q. Which is the vena epiploica dextra?

A. The trunk of the mesaraic sends out sometimes a particular branch to the omentum called epiploica dextra: but the mesaraic almost immediately before it ascends over the mesenteric artery, send two large branches to the jejunum and part of the ilium, which form arches and arcolæ on those intestines, like those of the artery, and sends out branches almost in the same manner.

Q. Which is the vena cæcalis?

A. This branch is the mesaraic vein called by Riolan cæcalis, arises a little below the ori-

gin of the second branch from the convex side; and supplies the cæcum, appendicula vermiformis, and beginning of the colon.

Q. Which is the vena hæmorrhoidalis interna?

A. The hæmorrhoidalis interna arises from the beginning of the mesaraica, sometimes from the splenica, and sometimes between both at the bifurcation: and is thus named from the hæmorrhoidal tumors found often at its extremity next the anus. It goes to the duodenum, colon, and on the rectum, all the way to the anus; and in its course supplies the mesocolon, and forms arches which send out numerous small ramifications round these intestines. It seems likewise to communicate, by some capillary twigs, with the left spermatic vein.

Q. Which is the vena splenica?

A. The splenic vein is one of the great branches of the portæ, and turns to the left hand, where the meseraic does to the right; it runs transversely from right to left, just under the duodenum, and along the lower side of the pancreas, and in its course gives off the vena pancreaticæ, gastrica sinistra, or gastro-epiploica sinistra and epiploica sinistra. It terminates afterwards by a winding course, being divided into several branches that go to the spleen, one of which produces the small veins called by the ancients vasa brevia; and at last the vena splenica reaches the fissure of the spleen, which it enters, and supplies almost in the same manner as the splenic artery.

Q. Which

D I A L O G U E S.

Q. Which are the venæ pancreaticæ?

A. The venæ pancreaticæ are several small branches sent by the splenica to the pancreas; but there are other small pancreatic veins, which do not arise from the splenica, which I have already spoken of.

Q. Which is the gastrica sinistra, or gastro-epiploica sinistra?

A. This is also a branch of the splenic vein arising at the left extremity of the pancreas, from whence it runs to the great extremity of the stomach, to which it gives several branches, and communicates with the gastrica dextra, and coronaria ventriculi: at a small distance from its origin this gastric vein sends out a branch which is distributed to the omentum, from whence the name of gastro-epiploica?

Q. Which is the vena gastro-epiploica, and epiploica sinistra?

A. The vena epiploica sinistra is also a branch of the splenic, and arises at the small extremity of the pancreas, and is ramified on the omentum all the way to the colon, where it communicates with the hæmorrhoidalis interna.

Q. Which are the vasa brevia?

A. From the posterior of the branches of the splenic vein, the veins are sent off to the great extremity of the stomach, formerly known by the name of vasa brevia; which communicate with the coronaria ventriculi, and gastrica sinistra.

Q. Which are the venæ renales?

R 2

A. The

A. The vena cava inferior having got as low as the arteriæ renales, gives off the veins of the same name, (termed formerly venæ emulgentes) and which are the largest of all the veins that go from the cava inferior, from the liver to the bifurcation. They accompany the renal arteries, and are ramified in the substance of the kidneys.

Q. Which are the venæ capsulares ?

A. The venæ capsulares et adiposæ arise from the venæ renales ; the former goes upward to the glandulæ renales, the latter down to the fatty covering of the kidneys.

Q. Which are the venæ spermaticæ ?

A. The right vena spermatica comes from the trunk of the cava inferior, a little below the venæ renales. The left comes commonly, though not always, from the left renalis ; both veins accompany the spermatic arteries. In their passage small branches are sent off to the peritonæum and mesentery, and sometimes a branch to the iliac muscle and membrana adiposa of the kidneys.

Q. Which are the venæ lumbares ?

A. The venæ lumbares arise posteriorly from the vena cava inferior most commonly in pairs, in the same manner as the arteriæ lumbares, but their origin often vary. They all communicate with one another, and sometimes with the intercostals. They supply the substance of the bodies of the vertebræ, muscles of the abdomen, quadratus lumborum, psoas, iliacus, &c. they send branches also backwards to the neighbouring vertebral muscles, and to the canal of the

the spine, and communicate with the venal sinuses in the same manner as the intercostals.

Q. Where is the bifurcation of the vena cava situated ?

A. The venæ cava inferior, having reached as low as the last vertebra of the loins, and near the bifurcation of the aorta, runs in behind the iliac artery, and is there divided into two subaltern trunks, called the right and left iliac veins, which lie on the inside of the iliac arteries which form the bifurcation of the vena cava.

Q. Which is the vena sacra ?

A. The vena sacra goes out from the bifurcation of the vena cava, and often from the origin of the left iliaca, and accompanies the arteria sacra to the os sacrum, to the nerves which lie there, and to the membranes which cover both sides of that bone.

Q. Which are the venæ iliacæ ?

A. The iliac veins arise from the bifurcation of the cava, as before mentioned, each original iliac vein is divided on the side of the os sacrum much in the same manner as the arteries, into two large trunks or secondary iliac veins. This second bifurcation is about a finger's breadth below that of the iliac arteries. One of these trunks is named vena iliaca externa, or anterior, the other interna, or posterior. The external vein is likewise named simply iliaca, and the internal, hypogastrica. These veins follow nearly the course and distribution of the iliac arteries, only the hypogastric does not send off the vena umbilicalis. Near this second bifur-

cation, a particular branch goes out to the musculus psoas, iliacus, and quadratus lumborum, and a branch of it to the transverse apophysis of the loins.

Q. Which is the vena iliaca externa?

A. The iliaca externa, a little before it leaves the abdomen, near the ligamentum Fallopii, lying on the psoas and iliac muscles, gives off the same branches as the external iliac artery, and follows the same course. See vena epigastrica.

Q. Which is the vena epigastrica?

A. The epigastrica arises from the inside of the iliaca externa, before it leaves the abdomen, and is ramified on the neighbouring conglobate glands and abdominal muscles, communicating with the ramifications of the mammaria which accompanies the epigastric artery. From the inside of this vein a branch is sometimes detached to the musculus obturator internus, where it joins another branch named vena obturatrix.

Q. Which is the vena hypogastrica?

A. The vena hypogastrica, or internal iliac vein, runs behind the artery of the same name, making the same kind of arch, from which branches go out to the cavity of the os sacrum, through the first and second great hole of the os sacrum to the neighbouring muscles. A large branch runs behind the great sciatic sinus to the musculus glutæi pyramidalis and gemelli. Another branch reaching the foramen ovale of the os inominatum, perforates the obturator muscles,

muscles, from whence it is called vena obturatrix.

Q. How is the vena obturatrix distributed?

A. The vena obturatrix is distributed to the musculus pectinæus, triceps, and neighbouring parts, communicating with the cruralis. One branch of the obturatrix, before it perforates the muscles, runs towards the sciatic sinus to the iliac muscle os ilium and part of the obturator internus, another branch is distributed to the ureters, bladder, and internal parts of generation in both sexes. It communicates with the spermatic veins, and is more considerable in women than in men. Lastly, the hypogastric vein runs backward, and as it goes out of the pelvis it is ramified both upward and downward: it sends a large branch upward to the lower part of the os sacrum, and two more downward, which going out of the pelvis are distributed to the buttocks, anus, part of the musculus pectineus, and to the external parts of generation, nearly in the same manner with the artery which accompanies them.

Q. Which are the venæ hæmorrhoidales externæ?

A. The veins that go to the anus are termed hæmorrhoidales externæ, and they that go to the parts of generation, pudicæ internæ. The external hæmorrhoidales communicate with the internal veins of the same name.

Q. How are the nerves of the abdomen distributed?

R 4

A. The

A. The five pair of lumbar nerves also communicate, and give posterior branches; the first pair sends several branches to the abdominal muscles, psoas, and iliacus, while others go from it to the teguments and muscles on the superior and anterior part of the thigh, and the main trunk of it is lost in the crural. The second pair passes through the psoas muscle, and is distributed much as the former. The third is lost in the musculus pectineus. Branches proceeding from these three pair make up one trunk, which supplies the anterior part of the pelvis, and going through the foramen magnum ossis ischii, is spent on the triceps muscle. This nerve is commonly known by the name of obturator, or posterior crural nerve. By the union of branches, from the first, second, third, and fourth lumbar nerves, the anterior crural nerve is formed. The remainder of the fourth and fifth lumbar nerves join with the first, second, and third, that proceed from the os sacrum (which are five or six pair). These two last of the lumbar and three first of the sacrum, when united, constitute the largest nerve in the body, so well known by the name of the sciatic or ischiatic nerve. The other nerves that come out of the os sacrum, are sent to the organs of generation and adjacent parts.

Q. What glands are there in the abdomen?

A. In the abdomen there are a very considerable number of glands; the largest of them is the pancreas, after this, in size come the glandulæ renales; then the mesaraics; and the intestinals (of Brunner and Peyer) in the intestines;

testines; all which I have already spoken of: the glands of the stomach are so small as not easy to be found. Near the receptaculum chyli, and above the os sacrum, and the divisions of the iliac vessels, are many glands of various sizes and figures, called lumbares, sacrae, iliacæ, &c. and they have numerous lymphatics entering into them, and discharging their contents into the receptaculum chyli. The lumbar glands have been sometimes found swelled to the bigness of a man's fist. In the concave part of the liver, about the ingress of the vena portæ and the neck of the gall bladder, as also about the spleen, near the ingress of the vessels, there are frequently found conglobate glands, of about the bigness of a kidney bean: these are called by authors, hepatic glands, cystic glands, or have other names derived from the adjacent parts; and they seem to serve the lymphatic vessels. About the left orifice of the stomach, there sometimes also is found, according to Vercellonius, a gland which he says is equal to a kidney-bean in size; he also says that it has ducts opening into the cavity of the stomach; in the gall-bladder there are sometimes found a number of small glands of a yellow colour, not unlike the ceruminose glands in the auditory passage. The bladder and the ureters have also sometimes a number of small glands, but they are very indeterminate in number and size, and are not always indeed found in the same place, especially about the ureters. Those about the bladder are usually situated towards the

the neck of it, and are sometimes tolerably conspicuous. The glands in the parts of generation of both sexes I shall describe hereafter with those parts.

DIALOGUE V.

Of the ARM and its PARTS.

Q. WHAT are the parts of the arm?

A. The arm comprehends the whole limb or member from the top of the shoulder to the finger's ends; to which you may add the clavicle and scapula, with the muscles thereto belonging. The arm includes the whole member, but the fore arm is from the elbow to the wrist only, the upper part of the arm, which joins with the scapula or shoulder-blade and clavicle, is termed humerus, which extends to the bend of the arm, the backside of which is called the elbow or olecranon, and the foreside or flexure, ancon; from thence toward the hand is called the fore-arm or cubitus; the end of which toward the hand is the wrist or carpus; between the carpus and the fingers is the metacarpus, to which is articulated, pollex, the thumb; index, the forefinger; digitus medius, the middle finger; digitus annularis, the ring finger; and digitus minimus, the little
cr.

Q. What

Q. What are the bones of the arm ?

A. The bones of the arm, including the scapula, clavicle, hand and fingers, are thirty-two (besides the sesamoidal bones, whose number is uncertain) viz. scapula, clavícula, humerus, ulna, radius, each one; carpus, eight; metacarpus, four; phalanges of the fingers and thumb, fifteen; as may be seen at one view in the table of osteology.

Q. Which is the clavícula ?

A. The clavícula is situated transversely on each side, between the scapula and sternum; its figure is somewhat like that of the letter S, and it is of a spongy and brittle substance. One end is connected to the sternum with a loose cartilage, and the other to the processus acromion of the scapula: The uses of the clavicles are, to keep the scapulæ at a sufficient distance from the breast, by which means the shoulders are hindered from coming near together, as they do in those quadrupeds which use their four limbs only to walk on, and not as men do their hands; to facilitate several of the motions of the arm; to serve for the place of origin for several muscles; and to defend the great subclavian vessels which run under them.

Q. Which is the scapula ?

A. The scapula, or shoulder-blade, is a triangular bone, situated on the back and outside of the ribs, and commonly extended from the second to the seventh. It is fixed to the sternum by the clavícula, to the ribs and spine by the muscles of those parts; its outside is a little convex, and its inside somewhat concave, to
fit

fit it to the outer surface of the ribs on which it moves, and partly to give room for the subscapularis muscle. The scapula has three processes, the first runs all along the middle of their outside, and is called their spine; that end of the spine which receives the extremity of the clavicle is called the processus acromion. The second process is a little lower than the acromion; it is short and sharp like a crow's bill, whence it is called coracoides; these two processes are tied to each other by a strong flat ligament, which serves to keep the head of the humerus in the cavity of the third process, and prevents its being dislocated upwards. It has a round sinus tipped about its brim with a cartilage, which receives the head of the humerus; at the fore-part of this edge, close to the coracoid process, is a semicircular notch for the passage of blood vessels, which notch is joined at the top with a ligament, and sometimes with a bone. The use of the scapula is to receive the extremities of the clavicle and humerus, for the easier motion of the arm, and to give rise to the muscles which move the arm. The base acromion, coracoid process, and head of the scapula, are all in a cartilaginous state at birth; and the three first are joined as epiphyses; while the head, with the glenoid cavity, is not formed into a distinct separate bone, but is gradually produced by the ossification of the body of this bone being continued forwards.

Q. Which is the os humeri?

A. The os humeri is the large bone of the arm, situated between the shoulder and the cubit,

bit, articulated at one end with the scapula, and at the other with the ulna and radius. Its upper end or head, where it is joined to the scapula, is somewhat flat, and much larger than the socket which receives it. At the upper part are two processes for the insertions of the muscles of the arms : between these processes is a long channel or groove, in which lies a tendon of the biceps cubiti. At the lower end are two considerable processes, both formed to give origins to muscles of the wrist and fingers ; between these processes is the joint. That part to which the upper end of the radius is fixed, is fitted not only for the motion of the elbow, but also for the rotatory motion of the radius ; the rest of this joint is made up of portions of unequal, but concentric circles, like the shanks of quadrupeds ; which inequality prevents the ulna from dislocating sideways, which so small a joint with so much motion would be very subject to. Of a like use is the little sinus on the fore part of the humerus, and the large one behind ; the first of which receives a process of the ulna when the arm is bent, and the other the olecranon, when the arm is extended. The os humeri has evidently the most free and extensive motion of any bone in the human body. Both the ends of this bone are cartilaginous in a new born infant, and the large head with the two tubercles and the trochlea with the two condyles, become epiphyses before they are united to the body of the bone.

Q. Which is the ulna ?

A. The

A. The ulna is one of the bones of the fore arm or cubit; reaching from the elbow to the wrist; it is big at its upper extremity, and grows gradually smaller towards its lower end. This bone is longer than the radius, and has a motion of flexion and extension: at its upper extremity it articulates with the os humeri and the crista of the radius, and its lower extremity articulates with the carpus, as also with the radius by means of a crista. At the upper end it has one large process or apophysis called olecranon, and a small process on the fore part, and on one side between there is also a small cavity, which receives the upper end of the radius for its rotatory motion; and down the side of this bone, next the radius, is a sharp edge, from which the ligament arises which connects these bones together. At the lower end is a process called styloformis, and a round head which is received into the radius for the rotatory motion of the cubit.

Q. Which is the radius?

A. The radius is the exterior bone of the cubitus or fore-arm, accompanying the ulna from the elbow to the wrist. In its upper extremity there is a glenoid cavity for its articulation with the humerus, which chiefly fits it for its rotatory motion, being also received into the ulna; for the strength of the elbow joint receives but little advantage from the union of these two bones. A little below this head is a large tubercle, into which the biceps muscle is inserted, which by the advantage of this insertion turns the cubit supine, as well as bends it. At the lower
end,

end, which is thicker, is a socket to receive the carpus, and at the side next the ulna a small one to receive that bone, and a thin edge, into which the transverse ligament, which arises from the ulna is inserted: this ligament ties these bones conveniently and firmly together; for the ulna being chiefly articulated to the os humeri, and the radius to the carpus, a weight at the hand without this ligament, would be liable to pull these bones asunder.

Q. What is the carpus?

A. The carpus or wrist, consists of eight small unequal, and irregular bones, divided into two rows, each row consists of four bones; in the first, are the os scaphoides or naviculare, lunare, cuneiforme, and orbiculare; in the second are the os trapezium, trapezoides, magnum and unciforme. The scaphoides is situated next the bones of the fore-arm, more particularly under the radius, on that side where the thumb is placed; the lunare is immediately on the outside of the scaphoides; the cuneiforme is placed still more externally, but not so high up as the other two; the orbiculare stands forwards from the cuneiforme; the trapezium is the first of the second row, which is nearer to the hand, it is situated between the scaphoides and the first joint of the thumb; the trapezoides is immediately on the outside of the trapezium; the os magnum is still more external; and the unciforme is farther to the side of the little finger. They have all obscure motions one with another, and with those of the second is more considerable, and they are moved by the same muscles

múscles which move the carpus on the radius. These bones are all larger behind than before ; the ligaments which unite them to one another, and two other adjacent bones, are so accurately applied to them, that at the first view the whole carpus of a recent subject appears on the smooth bone.

As the surfaces of these bones are largest behind, the figure of the whole conjoined must be convex there, and concave before ; which concavity is still more increased by the os orbiculare, and process of the os unciniforme, standing forwards on one side, as the trapezium does on the other : and the bones are securely kept in this form by the broad strong transverse ligament, connected to those parts of them that stand prominent into the palm of the hand. The convexity behind renders the whole fabric stronger, where it is most exposed to injuries ; and the large anterior hollow is necessary for a safe postage to the numerous vessels, nerves, and tendons of the fingers.

The substance of these bones is spongy and cellular, but strong in respect to their bulk.

All the bones of the carpus are in a cartilaginous state at the time of birth.

On account of the many tendons that pass upon the lower end of the fore arm, and the carpus and of the numerous ligaments of these tendons and of the bones, which have lubricating liquors supplied to them, the pain of sprains here is acute, the parts require a long time to recover their tone, and their swellings are very obstinate.

Q. What is the metacarpus ?

A. The

A. The metacarpus is that part of the hand between the wrist and the fingers; the inner part is called the palm, and the other the back of the hand. The metacarpus consists of four bones, which answer to the four fingers, whereof that which sustains the fore finger is the biggest and longest, but has the least motion, and that of the little finger the most. They are all round and long, a little convex towards the back of the hand, and concave and plain towards the palm. They are hollow in the middle, and full of marrow; they touch one another only at their extremities, having spaces in the middle in which lie the musculi interossei. In the upper end of these bones there is a sinus which receives the bones of the wrist; the other ends have round heads, which are received into the sinus of the first bones of the fingers. At the time of birth these bones are cartilaginous at both ends, which afterwards become epiphyses.

Q. How are the fingers distinguished and composed?

A. The fingers are four in number on each hand, exclusive of the thumb, viz. 1. index, the fore-finger; 2. medius, the middle finger; 3. annularis, the ring-finger; 4. minimus vel auricularis, the little finger. In the thumb and fingers are three bones, which make three phalanges, the upper of which (next the metacarpus) are much larger than the lower, next the extremities. These bones, on the inside, are flat and a little hollow or concave, which is necessary to make room for the flexors of the

S

fingers,

fingers, and to render their shape proper for grasping any thing. The thumb is shorter and stronger than any of the fingers, because in its actions it is to resist them all. The first phalanx, in the part where they are articulated with the bones of the metacarpus at their heads, have a glenoide cavity, by means of which articulation, they have a free motion every way. In the other extremity there are two heads with two cavities joined to the second phalanx, where the motions of flexion and extension are all that are possible; and the same is the case between the second phalanx and the third.

Q. What are the cartilages of the arm?

A. The cartilages of the arm, are those of the bones of the shoulder, os humeri, fore-arm, and hand.

Q. What are the cartilages of the bones of the shoulder?

A. The glenoide cavity of the scapula, which receives the superior head of the os humeri, is covered with a cartilage, which is a little raised above the edge of the bone. It is of a pliable slippery substance, yet something different from that of a cartilage, resembling in some measure the border of the acetabulum coxendix. The acromion has also a small cartilaginous surface; and the external extremity of the clavicle is crufted over with a cartilage, which is a little convex, and covers its whole triangular surface, besides which it has another moveable common cartilage already spoken of. The small cartilaginous surface of the numeral extremity of the clavicle, answering to that of the acromion, is, like that of the acromion, a little convex. Be-

tween

tween these two cartilages of the clavicle and acromion, there is in some subjects a thin inter-articular cartilage, very smooth on both sides.

Q. What are the cartilages of the os humeri ?

A. The cartilage by which the hemisphere of the head of the os humeri is covered, is gradually thicker towards the middle than towards the edges. The groove in the os humeri is covered by a crust, which is partly ligamentary and partly tendinous rather than cartilaginous. The lower head of the os humeri is covered by a common cartilage, and its fossulæ near the head with a thin cartilaginous or ligamentary varnish.

Q. What are the cartilages of the fore-arm ?

A. The two sigmoide cavities in the upper extremity of the ulna are covered by a cartilage common to both. The lower head of the ulna is crusted over by a cartilage ; the head of the radius is covered in the same manner. All the concave side of the basis of the radius is cartilaginous, and often divided by a small cartilaginous prominent line. At the basis of the radius there is likewise a particular additional cartilage, or triangular production longer than it is broad, very thin, and rather flat than concave on both its smooth sides. This cartilage may be termed the inter-articular cartilage of the joint of the wrist. It is tied to the radius by very short ligaments, and sliding on the small head of the ulna.

Q. What are the cartilages of the hand ?

A. All the bones of the carpus, metacarpus, and fingers, are crusted over with cartilages at

their ends for their mutual articulations, which may be termed cartilaginous surfaces, in which the impressions and notches where the mucilaginous glands are lodged are very perceptible.

Q. What are the ligaments of the arm?

A. The ligaments of the arm are those of the bones of the shoulder, os humeri, forearm, and hand.

Q. What are the ligaments of the shoulder?

A. The articulation of the acromion with the extremity of the clavicle, is strengthened quite round by several small strong ligaments, which go from one bone to the other. These ligaments lie very near each other, and are withal so tightly braced over the joint as to hide it altogether, and they appear more like a cartilaginous covering than a ligamentary texture. The internal surface of these ligaments is lined with the capsula of the joint. When the small inter-articular cartilage is found, its whole circumference is connected to these ligaments. The articulation of the clavicle with the sternum is sustained by several ligaments fixed by one end round the pectoral extremity of the clavicle, and by the other to the sternum, as before observed. There is a long, narrow, strong ligament, which goes from one clavicle to the other, behind the furca of the sternum, and may be called the inter-clavicular ligament. The neck of the scapula, at a small distance from the edge of the glenoid cavity, gives insertion to the capsular ligament or mucilaginous bag, and to the articular ligaments of the joint of the scapula

Scapula and os humeri. Besides the articular ligaments of the scapula, there are three ligamentary cords fixed to the tuberosity of the coracoide apophysis, two are inserted by the other end in the extremity of the clavicle, and the third under the acromion. A thin broad ligament also reaches between the crista of the spine of the scapula and the edge of its inferior costa.

Q. What are the ligaments of the os humeri?

A. The capsular or mucilaginous ligament loosely surrounds the whole articulation of the scapula, with the head of the os humeri; from its insertion round the edge of the glenoid cavity, already mentioned, it is continued over the hemisphere of the head of the os humeri, and fixed near its edges towards the muscular surfaces of the great and small tuberosities or processes. Afterwards it runs down gradually on the neck of the bone below the lowest part of the cartilaginous hemisphere, and is closely fixed in the bone, except in the groove or channel already mentioned, in which lies the tendon of the biceps cubiti. The true ligament of this joint seems to be made up of two sorts of ligaments closely united together, viz. a capsular ligament which surrounds the whole articulation, and several true ligaments which run over, and closely adhere to the former at different distances. On the body of the os humeri there are two long, flat, thin, strong, and narrow ligaments, fixed by one edge along the two lower thirds of the bone reaching to both condyles. The lower extremity of the os humeri is joined to the bones

of the fore-arm, by two fasciculi of ligamentary fibres, one fixed to the inner condyle, the other to the external. The capsular ligament is fixed to the condyles, and these cover them; and afterwards it is fixed round both sides of this lower extremity above the fossulæ, which fossulæ are only slightly varnished over with a cartilaginous substance.

Q. What are the ligaments of the fore-arm?

A. Some of the ligaments of the bones of the fore-arm are common to them with the os humeri, some common to them with the bones of the hand, and some are proper. The two proper are the interosseous ligament of the fore-arm, and one which may be termed the coronary ligament of the radius. To these may be added the annular ligaments, which only serve for the passage of tendons; and other ligamentary expansions, which may be called muscular ligaments, and shall refer a description of them till I come to speak of the muscles. The interosseous ligament of the fore-arm is very like that of the leg; it ties the ulna and radius closely together, and serves for the insertion of several muscles. In it are holes for the passage of the blood-vessels. The capsular ligament of the joint of the elbow runs down from its insertion in the os humeri (already mentioned) and is fixed in the olecranon round the edge of the great sigmoide cavity; it likewise runs over the head of the radius, and is fixed to the coronary ligament quite round. Thus it completely surrounds the articulation of these three bones, and serves to contain the mucilaginous liquor

Liquor furnished by the glands and fatty substance, both which are found in the greatest quantities near the extremity of the ulna. The true common ligaments by which the os humeri is connected to the bones of the fore-arm, called lateral ligaments, are the two fasciculi, which after being inserted in the condyles of the os humeri are expanded like a goose's foot. Of the ligaments by which the ulna and radius are connected to those of the hand, one is like a roundish cord, fixed in the styloide apophysis of the ulna, and in the os cuneiforme and bones of the carpus. All these ligaments surround and cover the capsular ligament so closely that they can hardly be distinguished from it. The capsula is likewise in part covered by a portion of a great oblique ligament, which is fixed by a very broad insertion in the large extremity of the radius, and passing obliquely is inserted into the os orbiculare. It is called the external transverse ligament of the carpus; and may likewise be named the great oblique ligament of the wrist.

Q. What are the ligaments of the hand?

A. The ligaments of the carpus are very numerous. Some of them tie each bone to one or two neighbouring bones in the same rank, but are so very short as to allow these bones only a small degree of motion. Some of them tie the bones of one row to those of the other, but they are not so short as the former, and therefore they allow these bones a more manifest motion, as we see in bending the wrist. Lastly, there are other ligaments of the carpus,
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by which the three first bones of the first row are connected to the bones of the fore-arm; and to these may be added the ligaments by which the bones of the second row are joined to those of the metacarpus and first phalanx of the thumb. The principal ligaments belonging to the articulation of the carpus with the bones of the fore-arm, I have already mentioned, except their insertion in the carpus, which is thus: the styloide ligament of the radius is fixed to the os scaphoides vel naviculare; and the styloide ligament of the ulna is fixed first in the os cuneiforme, and then in the os unciforme, from whence it is a little stretched over the fourth bone of the metacarpus. The ligaments which lie between the two former, go from the radius and ulna to the three first carpal bones, and the mucilaginous capsula, by which these ligaments are lined are also fixed to these bones. There is likewise a considerable ligament, called the inner transverse ligament, formerly called an annular ligament.

The bones of the metacarpus, besides the short ligaments by which they are tied to the second row of the bones of the carpus, have several others, by which both their bases and heads are connected together. The bases of the third and fourth bones are not so closely tied as the rest, and therefore they have a very sensible motion, which, however, is greater in the fourth than in the third. The heads of these bones are firmly tied to each other by a strong transverse ligament, situated in the palm of the

hand, through which the tendons of the flexor muscles of the fingers have a free passage. The first phalanx of the thumb and fingers is fixed by short ligaments that pass obliquely over the articulation with the metacarpal bones. The second phalanx of the thumb is joined to the first by ligaments of the same kind. The other phalanges are joined by lateral ligaments almost in the same manner as the bones of the fore-arm to the os humeri. The two first phalanges of each finger have very strong ligamentary vaginae inserted in the rough ridges on their flat sides. These vaginae are lined with a mucilaginous membrane, which runs like a tube from one phalanx to the other, over the articulation.

Q. What are the muscles of the arm ?

A. The muscles of the arm and its parts include those of the clavicle, scapula, and breast, which belong thereto, though situated on the superior part of the trunk; for this reason I omitted their description in describing those of the thorax. They are as follows, viz. subclavius, trapezius, rhomboides, elevator scapulæ, serratus major et minor anticus, pectoralis, deltoidea, supraspinatus, infraspinatus, teres minor et major, latissimus dorsi, subscapularis, coraco-brachialis, biceps cubiti flexor, brachii internus, supinator radii longus et brevis; triceps extensor cubiti, anconæus, palmaris longus, et brevis; flexor carpi radialis et ulnaris, extensores carpi radiales, extensor ulnaris, pronator quadratus, et teres, perforatus, perforans, lumbricales, extensor digitorum communis, minimi digiti, extensor indicis, abductor primi digiti

digiti interossæi, minimi digiti ossis, metacarpi minimi digiti, extensor primi secundi et tertii internodii pollicis, flexor primi et secundi ossis pollicis, flexor tertii internodii pollicis, abductor pollicis.

Q. Which is the musculus subclavius ?

A. The musculus subclavius is a small oblong muscle lying between the clavicle and first rib ; it arises from the superior part of the first rib, and is inserted into almost all the middle portion of the under side of the clavícula. Its use is to draw the clavícula toward the sternum, that it may not be severed in the motions of the scapula.

Q. Which is the trapezius ?

A. The trapezius, vel cucullaris, is a muscle of the scapula, which arises from the os occipitis, and from a linea alba vel ligamentum colli, from the spinal process of the last vertebra of the neck, and the ten uppermost of the back, and from a linea alba between all these processes ; it is inserted into one third of the clavicle next the scapula, almost all the back part of the spine of the scapula, and as much of the processus acromion as lies between the spine of the scapula and the clavicle. This muscle draws the scapula directly backward.

Q. Which is the rhomboides ?

A. The rhomboides is a thin, broad, and obliquely square, fleshy muscle, situated between the basis of the scapula and the spina dorsæ. It ariseth from the spinal process of the two inferior vertebræ of the neck, and the four superior of the back ; and is inserted into the whole

whole basis of the scapula, which it draws up and backward.

Q. Which is the elevator scapulæ?

A. The elevator scapulæ is a long and pretty thick muscle, about two fingers breadth, it arises from the transverse apophyses of the four first vertebræ of the neck, and running a little obliquely, is inserted into the upper angle of the scapula for its elevation.

Q. Which is the serratus major anticus?

A. The serratus major anticus is a broad, fleshy, and pretty thick muscle, situated on the lateral part of the thorax, between the ribs and the scapula, by which it is covered. It arises by dentated origins (resembling a saw, from whence the name of serratus) from the anterior part of the eight superior ribs, and is inserted into the basis of the scapula, which it draws forward and upward. This muscle is an elevator of the ribs.

Q. Which is the serratus minor anticus?

A. The serratus minor anticus, vel pectoralis minor, arises from the third, fourth, and fifth ribs, continues its course under the pectoralis major, and is inserted into the processus coracoides scapulæ, which it pulls forward and downward. This is also an elevator of the ribs.

All the muscles inserted into the basis of the scapula are also inserted into one another.

Q. What is the musculus pectoralis?

A. The pectoralis (by some called pectoralis major) possesses almost the whole breast being a large, thick, fleshy muscle, covering the
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fore part of the breast, from the sternum, where it is very broad, to the axilla, where it contracts in its passage to the arm. It arises from near two thirds of the clavícula, next the sternum, and all the length of the os pectoris, and from the cartilages of the ribs; and is inserted into the os humeri about four fingers breadth below its head, between the biceps and the insertion of the deltoides. The use of it is to draw the arm forward.

A small portion of the lower part of this muscle is often confounded with the obliquus descendens abdominis; in some bodies neither the upper part nor its tendon can be easily separated from the deltoides; and in others, even that part of it that arises from the clavícula is a distinct portion.

Q. Which is the deltoides?

A. The deltoides is a very thick, triangular muscle, covering the upper part of the arm, and forming what is called the stump of the shoulder. It is one of the elevators of the arm. It arises from the clavícula, acromion, and spine of the scapula, and is inserted near the middle of the os humeri, which bone it lifts directly upward.

Q. Which is the supra spinatus?

A. The supra spinatus, vel superscapularis superior, arises from the dorsum scapulæ, above the spine, and passes between the acromion and neck of the scapula, and under the ligament between the acromion and processus coracoides. It is inserted into the upper part of the os humeri, near its groove, or bony channel. It helps

helps to lift the arm upwards, until it becomes parallel with the *spina scapulæ*.

The *supra spinatus deltoïdes* and *coraco-brachialis*, assist in all the motions of the humerus, except depression; it being necessary that the arm should be raised and sustained, in order to move it to any side.

Q. Which is the *infra spinatus*?

A. The *infra spinatus*, vel *superescapularis inferior*, arises from the *dorsum scapulæ* below the spine, and is inserted, wrapping over part of it, at the side of the head of the *os humeri*; it turns the arm supine and backward.

Q. Which is the *teres minor*?

A. The *teres minor* is an abductor muscle, as well as the *infra spinatus*, below which it has its origin from the inferior *costa* of the scapula, and is inserted together with the *infra spinatus*, which it assists in turning the arm supine, but pulls it more downwards.

A. Which is the *teres major*?

A. The *teres major* is a depressor muscle, which has its origin at the lower angle of the scapula, and is inserted at the under part of the *os humeri* about three fingers breadth from the head. This muscle draws the *os humeri* toward the lower angle of the scapula, and turns the arm prone and backward.

Q. Which is the *latissimus dorsi*?

A. The *latissimus dorsi* is a very broad muscle, covering almost the whole back; it has a thin broad tendinous beginning, which arises from the spinal processes of the ilium, *os sacrum* *vertebræ* of the loins, and from the seven inferior

rior vertebræ of the thorax. It is inserted into the os humeri with the teres major, by a strong and broad tendon, with which it pulls the arm downward and backward.

Q. Which is the subscapularis ?

A. The subscapularis is a muscle of the same breadth and length with the scapula, filling up the hollow or under side of it (whence its name) from which it arises, and is inserted into the neck of the os humeri, wrapping somewhat over it. This muscle pulls the arm to the side and prone.

Q. Which is the coraco-brachialis ?

A. The coraco-brachialis arises from the processus coracoides scapulæ, and passing over the articulation, is inserted into the middle and internal part of the humerus; this with the deltoides and supraspinatus, lifts the arm upwards, and turns it somewhat outward.

Q. Which is the biceps cubiti flexor ?

A. The biceps cubiti flexor arises with two heads, that the fibres of this muscle should not compress one another. One head arises with a long, round tendon, from the upper edge of the acetabulum scapulæ, running under the ligament of the articulation, in a channel or groove on the head of the shoulder bone, (before-mentioned,) wherein it is inclosed by a proper ligament, afterwards it becomes fleshy, and joins the other head, which arises from the processus coracoides scapulæ, in common with the coraco-brachialis muscle, and is inserted with the first head into the tubercle, at the upper head of the radius. Sometimes this muscle
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has a third head, which arises from the middle of the os humeri. This muscle lifts up the humerus, bends the cubit, and has as great a share as any one muscle in turning the cubit supine; the humerus being fixed by other muscles, the whole force of this muscle will be exerted upon the cubit, or the cubit being fixed by an extensor, the whole force of it will be spent in raising the arm, and therefore ought to be always reckoned among those that raise a weight at arm's length.

The tendinous expansion of this muscle, in the flexure of the cubits, is sometimes pricked in bleeding (by injudicious operators) which generally occasions a most violent pain and inflammation, and has been attended with fatal consequences. The great mischief arising from pricking this tendinous fascia, seems owing to its lying so much upon the stretch, which may be wholly avoided by bending the elbow and turning the cubit. Cheselden observes on this subject, that many have been the instances of larger tendons being cut and stitched without any bad symptoms, and that they have been cut, torn, ulcerated, and mortified, without any more sign of pain than in other parts, so that it is difficult to find out what the great mischief of pricking this tendinous fascia is owing to, unless its lying so much upon the stretch, which may be wholly avoided by bending the elbow, and turning the cubit prone.

Q. Which is the brachiaëus internus?

A. The brachiaëus internus lies partly under the biceps, and arises from the internal part
and

and below the middle of the os humeri, near the insertion of the deltoides, and coraco-brachialis muscles; it is inserted in the tubercle of the ulna, a little below its upper head. This muscle helps also to bend the arm.

Q. Which is the supinator radii longus?

A. The supinator radii longus has its origin from the exterior part of the humerus, and is inserted into the upper side of the radius near the carpus. This muscle, some say, is not a supinator, but a bender of the cubit.

Q. Which is the supinator radii brevis?

A. The supinator radii brevis, arises from the lower part of the external condyle of the os humeri, and from the upper part of the ulna, and is inserted near the tubercle of the radius. This muscle serves also to turn the palm of the hand upward, and to bend the cubit.

Q. Which is the triceps extensor cubiti vel brachii externus?

A. The triceps extensor cubiti is divided into three heads. The first arises from the inferior costa of the scapula near the acetabulum; the second, from the outer and back part of the os humeri; the third, lower and more internal; and are inserted into the processus olecranon of the ulna. The first of these heads draws the arm backward.

Q. Which is the anconæus?

A. The anconæus arises from the back part of the extremities of the humerus, passes over the elbow, and is inserted into the upper part of
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of the ulna. This muscle is also an extensor of the cubit.

Q. Which is the palmaris longus?

A. The palmaris longus arises from the inner condyle of the os humeri; it soon after becomes a tendon, joins the ligamentum transversale carpi, and is expanded in the palm of the hand. This muscle is often wanting, but the expansion in the hand never; yet being connected to the ligament of the carpus, it must bend the carpus, and cannot constrict the palm of the hand.

Q. Which is the palmaris brevis?

A. The palmaris brevis, or caro quadrata, is in form of a small mass of flesh, very different in size in different bodies. It arises obscurely from the ligamentum transversale carpi, and seems to be inserted into the eighth bone of the carpus, and the metacarpal bone of the little finger. This helps to constrict the palm of the hand.

Q. Which is the flexor carpi radialis?

A. The flexor carpi radialis arises from the inner extuberance of the os humeri, and soon becoming a strong tendon, passes through a channel of the fifth bone of the carpus, and is inserted into the metacarpal bone of the fore finger. This not only bends the carpus upon the radius, but also the bones of the second order upon those of the first.

Q. Which is the flexor carpi ulnaris?

A. The flexor carpi ulnaris arises from the same tubercle of the humerus as the former, and a fascia betwixt this muscle and the tensor

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ulnaris,

ulnaris, contiguous to the ulna, and is inserted by a short tendon into the fourth bone of the carpus.

Q. Which are the extensores carpi radiales ?

A. The first of the extensores carpi radiales, arises from the os humeri immediately below the supinator radii longus, and is inserted into the metacarpal bone of the middle finger. The first of these muscles is a bender of the cubit, as well as an extensor of the carpus.

Q. Which is the extensor ulnaris ?

A. The extensor ulnaris arises from the same extuberance with the former, and half the ulna below the anconæus muscle ; then, becoming a tendon, it runs in a small sinus at the bottom of the ulna, and is inserted into the metacarpal bone of the little finger. The extensors of the carpus being inserted into the metacarpus, at once perform the motion between the bones of the carpus and radius. The flexor and tensor ulnaris acting together turn the hand downward, the tensor and flexor radialis upward.

Q. Which is the pronator quadratus ?

A. The pronator quadratus vel transversus, lies transversely on the inside of the lower extremity of the fore-arm. It arises from the lower part of the ulna near the carpus, and passing under the flexors of the fingers, is inserted into the lower extremity of the radius.

Q. Which is the pronator teres ?

A. The pronator teres, vel obliquus, is situated in the upper part of the ulna, opposite to the supinator brevis. It arises from the internal condyle of the os humeri, and upper and
fore

fore part of the ulna, and is inserted into the radius below the supinator brevis.

Q. Which is the perforatus, &c ?

A. The perforatus, or flexor secundi internodii digitorum, called also sublimis, arises from the inner tubercle of the os humeri, and from the upper part of the ulna, and the middle of the radius; then becoming four strong tendons, it passes under the ligamentum transversale carpi, and is inserted into the beginning of the second bone of each finger.

Q. Which is the perforans ?

A. The perforans, or flexor tertii internodii digitorum, arises from half the ulna, and a great part of the ligament between the ulna and radius, then becoming four tendons, passes under the ligamentum transversale carpi, and through the tendons of the former muscle to their insertion into the third bone of each finger. The tendons of both these muscles are tied down to the fingers by a strong ligament.

Q. Which are the lumbricales ?

A. The lumbricales, or flexores primi internodii digitorum, arise from the tendons of the last mentioned muscle, and are inserted laterally toward the thumb into the beginning of the first bone of each finger.

Q. Which is the extensor digitorum communis ?

A. The extensor digitorum communis arises from the external protuberance of the humerus, and at the wrist it passes under a ligament, and divides into four tendons, which are afterwards

inserted into the beginning of the second bone of each finger. These tendons communicate upon the first joint, which keeps them from sliding off the joints of the fingers, being a little connected to the first bones.

Q. Which is the extensor minimi digiti ?

A. The extensor minimi digiti vel auricularis, is a portion of the last muscle, passing under the ligament in a direct channel.

Q. Which is the extensor indicis ?

A. The extensor indicis comes from the middle and external part of the ulna, and passing under the ligaments of the carpus, is inserted with the extensor communis into the fore finger. This muscle extends the fore-finger singly.

Q. Which are the abductor primi digiti interossei, and abductor minimi digiti ?

A. The abductor primi digiti interossei, and abductor minimi digiti, are eight muscles, one for each side of each finger. The abductor primi digiti arises from the first bone of the thumb, and the side of the metacarpal bone of the fore-finger. The interossei are three pair; fitly divided into external and internal; the external arise from the metacarpal bones, whose spaces they fill up next the back of the hand; the internal arise from the same bones in the inside of the hand.

Q. Which are the abductor minimi digiti ?

A. The abductor minimi digiti arises from the transverse ligament, and fourth bone of the carpus; these muscles are inserted, two into the first joint of each finger, and then passing obliquely

obliquely over the tops of the fingers, are inserted into their last bones ; they bend the first joint, and extend the two last, as in holding a pin, and in playing upon some musical instrument. The abductors of the fore and little fingers, with the second and fifth interossei muscles acting, the fingers are divaricated, and the other four acting bring them together ; these muscles which divaricate the fingers, being extenders of the second and third joints, we never can divaricate them without extending them a little.

Q. Which is the abductor ossis metacarpi minimi digiti ?

A. The abductor ossis metacarpi minimi digiti arises from the eighth bone and transverse ligament of the carpus, and is inserted into the metacarpal bone of the little finger, which it pulls toward the thumb, to constrict the palm of the hand.

Q. Which is the extensor primi internodii pollicis ?

A. The extensor primi internodii pollicis arises, from the ulna, below the anconæus muscle and the ligament between the ulna and radius ; then becoming two, three, or four tendons, is inserted into the fifth bone of the carpus, and first of the thumb. The first of these insertions can only assist the bending of the wrist upward, and in turning the arm supine.

Q. Which is the extensor secundi, &c ?

A. The extensor secundis internodii pollicis arises immediately below the former, from the

radius and transverse ligament, and is inserted into the second and third bone of the thumb.

Q. Which is the extensor tertii internodii pollicis?

A. The extensor tertii internodii pollicis arises immediately below the last described, from the ulna and ligament, and passes over the radius nearer the ulna, to be inserted into the third bone of the thumb. This extends the thumb more towards the ulna than the former muscle, and is very much a supinator.

Q. Which is the flexor primi et secundi ossis pollicis?

A. The flexor primi et secundi ossis pollicis arises from the fifth bone and transverse ligament of the carpus, and from the beginnings of the two first metacarpal bones, and is inserted into the whole length of the first bone of the thumb, and tendinous into the beginning of the second; the sesamoid bones of the thumb in such bodies as have them, lie in this tendon, where it passes over the joint.

Q. Which is the flexor tertii internodii pollicis?

A. The flexor tertii internodii pollicis arises large from almost all the upper part of the radius, and becoming a round tendon, passes under the ligamentum transversale carpi to be inserted into the third bone of the thumb. This muscle singly acting draws the thumb towards the metacarpal bone of the little finger; but the last mentioned muscle acting with it, turns it toward the fore finger.

Q. Which

Q. Which is the abductor pollicis?

A. The abductor pollicis arises from the carpus, and almost the whole length of the metacarpal bone of the middle finger, and is inserted into the beginning of the second bone of the thumb. This muscle naturally enough divides into two, and might better be called a flexor than an abductor.

Q. Which is the abductor pollicis?

A. The abductor pollicis arises from the fifth bone and ligamentum transversale of the carpus, and is inserted laterally into the beginning of the second bone of the thumb to draw it towards the radius.

The muscles which bend the thumb are much less than those which bend the fingers, nevertheless, the thumb is able to resist all the fingers merely from the advantages that arise from the thickness and shortness of the bones of the thumb, compared with those of the fingers; but then the quickness of motion in the fingers will exceed that of the thumb, as much as the fingers exceed the thumb in length, and their muscles those of the thumb in largeness.

Q. What are the arteries of the arm?

A. The arteries of the arm proceed all from the subclavian: the various branches it gives off before it leaves the thorax have been already mentioned. From the arteria thoracica a branch in particular runs down between the deltoides and pectoralis, together with the vena cephalica, to which it adheres very closely, as if there were an anastomosis between them. Another branch sometimes runs between the musculus brachialis,

and anconæus internus, which communicates with a branch of the radial artery. The subclavian artery having left the thorax immediately above the first rib, in the interstice left between the portions of the scalenus muscle, gives off the arteries above mentioned, and the external scapulary, and then receives the name of axillaris, (because it passes under the axilla) from whence proceed the arteria humeralis, brachialis, cubitalis, and radialis.

Q. Which are the arteriæ scapulares?

A. The external scapulary artery passes thro' the notch in the superior costa of the scapula, to the musculus supraspinatus and infraspinatus, teres major et minor, and to the articulation of the scapula with the os humeri. The internal scapularis arises from the axillary artery near the axilla, and runs backward to be distributed to the scapularis, giving branches and ramifications to the serratus major, axillary glands, teres major, infraspinatus, and upper portion of the anconeus.

Q. Which is the arteria humeralis?

A. The arteria humeralis arises from the lower and fore side of the axillaris, and runs backward between the head of the os humeri and teres major, surrounding the articulation till it reaches the posterior part of the deltoides, to which it is distributed; in its course it supplies the superior portions of the anconeus, the capsular ligament of the joint of the shoulder, and the os humeri itself, through several holes immediately below the great tuberosity of the head of that bone, communicating with the
scapular

scapular artery. Opposite to the origin of the humeralis the axillaris sends off a small branch in a contrary direction between the head of the os humeri and the upper part of the biceps and coraco-brachialis, which goes to the vagina and channel of the biceps, and to the periosteum, and afterwards joins the humeralis.

Q. Which is the arteria brachialis?

A. The axillary artery having given off the humeralis and its branches, as I have mentioned, passes immediately behind the tendon of the pectoralis, where it changes its name to brachialis, which runs down on the inside of the arm over the musculus coraco-brachialis, and triceps extensor cubiti, and along the inner edge of the biceps behind the vena basilica, giving small branches on both sides to the neighbouring muscles, to the periosteum, and to the bone. Between the axilla and middle of the arm, it is covered only by skin and fat; but afterwards it is hid under the biceps, and runs obliquely forward as it descends; but it does not reach the middle of the fold of the arm. In its passage to this place it sends off many branches to the infraspinatus, teres major and minor, subscapularis, latissimus dorsi, serratus major, and other neighbouring muscles, to the common integuments, and even to the nerves. Below the fold of the arm it divides into two principal branches, which I shall mention by and by, one called cubitalis, the other radialis. From the upper and inner part the brachialis it sends off a particular branch, which runs obliquely downward and backward over the anconeus,

næus, and then turns forward again near the external condyle, where it communicates with a branch of the radialis.

Immediately below the insertion of the *teres major* it gives off another branch, which runs round the *os humeri*, and descends obliquely forward between the *musculus brachiiæus* and *triceps extensor cubiti*, to both which it is distributed in its passage. About the breadth of a finger below the second branch, the brachial artery sends off a third branch toward the internal condyle as the second is to the external condyle, both which communicate with the arteries of the cubit. Near the middle of the arm the *brachialis* sends off a branch between the *brachiiæus* and the *triceps* to the *periosteum* which penetrates the bone. About an inch lower it gives off a branch, which sends ramification to the *triceps* and runs over the inner condyle. Below the middle of the arm another branch runs behind the inner condyle in company with a considerable nerve. A little lower another branch is sometimes detached on the fore-side of the inner condyle; all these three branches communicate with branches of the cubital artery, and are termed collateral arteries. The common trunk of the brachial artery having reached the fold of the arm, runs together with a vein and a nerve, immediately under the aponeurosis of the *biceps*, and passes under the *vena mediana*, detaching branches on each side to the neighbouring muscles.

About an inch beyond the fold of the arm, the brachial artery divides into two principal branches.

branches. The inner or posterior named cubitalis ; and the outer or anterior named radialis, as has been already said. From this bifurcation the brachial artery sends branches on each side to the supinator and pronator muscles, teres, fat, and skin.

Q. How is the arteria cubitalis distributed ?

A. The cubital artery, proceeding from the brachialis, as I have before observed, sinks in between the ulna and the upper parts of the pronator teres, perforatus, palmaris longus, and flexor carpi radialis : then leaving the bone it runs down between the perforatus and palmaris longus, all the way to the carpus and great transverse ligament. In this course it winds and turns several ways, and sends out several branches ; very often there is a branch of communication between the brachial and cubital arteries. This communicant branch is sometimes very large, and liable to be pricked by careless or injudicious blood-letters in bleeding in the basilic vein, immediately under which this branch generally lies. When the operation for an aneurism is made upon the communicant branch, it must be tied on both sides of the orifice, because the blood is liable to flow freely into it either way.

The first branch of the cubital is a small artery which runs to the inner condyle, then turns up, and communicates with the collateral arteries before mentioned. Another small branch almost surrounds the articulation. The cubital artery running then between the heads of the ulna and radius, and having reached the interosseous

interosseus ligament, sends off two principal branches which may be called interosseous arteries of the fore-arm, one internal, the other external. The external pierces the ligament about three fingers breadth below the articulation, from which runs up a branch to the external condyle of the os humeri under the extensor ulnaris and anconæus, to which it is distributed, as also to the supinator brevis, communicating with the collateral arteries on the same side. Afterwards this external interosseous runs down on the outside of the ligament, and is distributed to the extensor ulnaris, extensor digitorum communis, and to the extensores pollicis indicis, and minimi digiti; communicating with branches of the internal interosseous. At the lower extremity of the ulna it unites with a branch of the internal interosseous, and is distributed, together with it, on the back of the hand, communicating with the radialis and a branch of the cubitalis.

By these communications this artery forms a sort of irregular arch, from whence branches are detached to the external interosseous muscles, and to the external lateral parts of the fingers. The internal interosseous artery runs down very close to the ligament, which it perforates between the pronator teres, and pronator quadratus, and goes to the back of the hand, where it communicates with the external interosseous radialis, and the internal branch of the cubitalis. From the origin of the two arteriæ interossæ the cubitalis runs down between the perforatus, perforans,

perforans, and flexor carpi ulnaris, along the ulna, sending branches to the neighbouring parts. Afterwards the cubital artery passes over the internal transverse ligament of the carpus by the side of the os pisciforme vel orbiculare, and having furnished the skin, palmaris brevis, and metacarpus, it slips under the aponeurosis palmaris, giving off a branch to the abductor minimi digiti, and another towards the thumb between the tendons of the flexors of the fingers and the bases of the metacarpal bones. A branch runs also between the third and fourth bones of the metacarpus to the back of the hand, where it communicates with the external interosseous artery. Afterwards, having supplied the interosseous muscles, it communicates with the radialis, and they both form an arterial arch in the hollow of the hand in the following manner: about two fingers breadth beyond the internal annular ligament of the carpus, the cubitalis forms an arch, the convex side of which is turned to the fingers, and commonly sends off three or four branches; the first, to the inner and back part of the little finger; and the other three run in the interstices of the four metacarpal bones, near the heads of which, each of them is divided into two branches, which run on each side the fingers internally, and at the ends of the fingers these digital arteries communicate and unite with each other. From the concave side of this arch towards the second phalanx of the thumb, a branch goes to the internal lateral part thereof, and then ends near the head of the first metacarpal bone, by a communication.

munication with the radialis; having first given a branch to the fore-side of the index, and another to the side of the thumb; these communicate as the other digital arteries. This arch sends likewise small twigs to the interosseous muscles, lumbricales, palmaris, and other neighbouring parts; and lastly to the integuments.

Q. Which is the arteria radialis?

A. The radial artery proceeds from the brachialis, as before observed, and begins by detaching a small branch upward toward the fold of the arm, which also turns backward round the external condyle, communicating with the neighbouring branches of the brachial artery. The radial artery runs down on the inside of the radius, between the supinator longus, pronator teres, and the integuments, giving branches to these muscles, and likewise to the perforatus, perforans and supinator brevis. From thence it runs in a winding course toward the extremity of the radius, supplying the flexor of the thumb and pronator quadratus. Having reached the extremity of the radius, it runs nearer the skin, especially toward the anterior edge of the bone, being the artery which we there feel when we examine the pulse. At the end of the radius it gives off a branch to the abductor pollicis, which detaches one to the whole internal side of the thumb; afterwards it runs between the first phalanx and tendons of the thumb, to the interstice between it and the first metacarpal bone, where it turns toward the hollow of the hand, and sends off a branch to the external side of the thumb.

thumb. Other branches of the radialis run transversely outward between the first two bones of the metacarpus and the two tendons of the extensores carpi radialis; they communicate with the cubitalis, and together furnish the external interosseus muscles and integuments of the back of the hand. Lastly, the radialis terminates in its passage over the semi interosseous muscle of the index, near the basis of the first metacarpal bone, and runs under the tendons of the flexor muscles of the fingers, where it is joined to the arch of the cubitalis. It sends off another branch along the fore part of the first bone of the metacarpus to the back of the index, where it is lost in the integuments; it gives also a branch to the internal side of the index, and at the end of the finger joins an opposite branch which comes from the arch of the cubitalis. Another small branch crosses the internal interosseous muscles, and communicates with the great arch. Where the arch of the cubitalis ends at the middle finger, the radialis runs along the inner part of the first metacarpal bone, at the head of which it terminates by two branches; one runs along the inner side of the index, and the other passes between the flexor tendons of this finger and the metacarpal bone, and having communicated with the cubital branch of the middle finger, it advances on the posterior lateral part of the index to the end of the finger, where it unites again with the first branch.

Q. What are the veins of the arm?

A. The

A. The veins of the arm, &c. likewise proceed from the subclavian, and the various branches are distinguished by the names of the parts they are bestowed on, in the same manner as the arteries already mentioned, viz. *vena axillaris*, *cephalica*, *basilica*.

Q. Which is the *vena axillaris* ?

A. The subclavian vein, having sent off the branches already described, goes out of the thorax, and passes before the anterior portion of the *musculus scalenus*, and between the first rib and the clavicle to the axilla. Through this course it takes the name of *vena axillaris*, and gives off several branches, the chief of which are the *venæ musculares*, *thoracicæ* and *vena cephalica*, which is sometimes double. The first veins which it sends off are the *musculares*, distributed to the middle portion of the *musculus trapezius*, to the *angularis*, *infraspinatus* and *subscapularis* : a little before the *axillaris* reaches the axilla, it sends out the *venæ thoracicæ*, one superior called also *mammaria externa*, and the other inferior. It likewise sends branches to the *musculus subscapularis*, *teres major*, *teres minor*, *supra-spinatus*, *latissimus dorsi*, *ferratus major*, *pectoralis*, and to the glands of the axilla.

Q. Which is the *vena cephalica* ?

A. The *axillaris*, having reached the side of the head of the *os humeri*, produces a very considerable branch named *vena cephalica*, and afterwards runs along the arm by the name of *vena basilica* ; however, the *basilica* sometimes appears to be rather a branch than a continuation

tion of the axillary trunk ; in which case the cephalica and basilica might be looked upon as two principal branches of the axillaris. The cephalic vein, which is a branch of the axillaris, at a small distance from its origin, joins the small cephalica from the subclavia or jugularis externa ; having till then run near the surface of the body between the deltoides and pectoralis. The great cephalica runs down between the tendons of the last mentioned muscles and along the external edge of the biceps, to the neighbouring muscles, fat and skin communicating with the basilica : a little below the external condyle of the os humeri, it sends off a branch backward. Near the fold of the arm it divides into two principal branches, one long, the other short. The long branch is named radialis externa, and the short one may be called mediana cephalica, to distinguish it from another mediana, which is a short branch of the basilica, and therefore ought to be called vena mediana basilica. The external radial vein runs along the radius between the muscles and integuments, and gives off branches to both sides, communicating and forming areolæ much like the saphena.

The mediana cephalica runs down toward the middle of the fold of the arm, under the integuments, and over the tendon of the biceps, where it joins the mediana basilica before mentioned. These two medianæ unite in an angle, the apex of which is turned downward. From this angle a considerable branch goes down the fore-arm, uniting on one side with the vena

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cephalica;

cephalica, and communicating on the other with the basilica, by several irregular areolæ.

The name of mediana is given to this large branch as well as to the two short ones, by the union of which it is formed; this large branch is the true mediana, and that name only sufficiently distinguishes it, as the others are also termed cephalica and basilica. From this union of the two lateral medianæ, a branch goes down the inside of the fore-arm called vena cubiti profunda. The mediana cephalica sometimes sends down a long branch, called radialis interna, almost parallel to the externa; afterwards, having reached the extremity of the radius, it is distributed by a numerous areolæ almost in the same course with the radial artery; it gives off a branch which runs superficially between the thumb and metacarpus by the name of cephalica pollicis. The areolæ furnish the interosseous muscles and integuments, and communicate with a small branch from the basilica called by the ancients salvatella.

Q. Which is the vena basilica?

A. The basilic vein proceeds from the subclavian, as before mentioned, and has sometimes a double origin by a branch of communication with the trunk of the axillaris. First of all it sends off, under the head of the os humeri, a pretty large branch, which passes almost transversely round the neck of that bone, and running upon the scapula it is ramified in the deltoïdes; this branch may be named subhumeralis, or articularis, as the artery; it sends down to principal branches, one on the inside
of

of the bone, to which and the periosteum it gives small veins; the other turns forward, towards the middle of the arm between the bone and the biceps. Below the neck of the os humeri, near the hollow of the axilla, and behind the tendon of the pectoralis, the basilica sends out a considerable branch down the side of the brachial artery, which supplies the neighbouring muscles on both sides. Immediately afterwards the basilica detaches two or three small veins very closely joined to the brachial artery, and divides at the fold of the arm like the artery, having the same divisions along the whole fore arm afterwards, the basilica continues its course along the inside of the os humeri, between the muscles and integuments which it supplies. Having reached the inner condyle, and sent off obliquely in the fold of the arm, the mediana basilica, it runs along the ulna between the integuments and muscles, a little toward the outside by the name of cubitalis externa, and another branch, which the mediana basilica sends down the inside of the fore-arm near the ulna, may be named cubitalis interna. The basilica, having reached the extremity of the ulna, sends several branches to the back-side of the carpus, one of which named salvatella, goes to the side of the little finger next the ring-finger, having first communicated with the cephalica, by means of the venal areolæ conspicuous on the back of the hand. In the other fingers the vein follows nearly the same course with the artery.

Q. What are the nerves of the arm?

A. The nerves of the arm, &c. come originally from the medulla spinalis, and proceed immediately from the cervical nerves. The considerable branches into which the nerves of the arm are divided are six, which Dr. Monro names as follows.

1. Cutaneus, runs down the fore part of the arm, and serves the teguments as far as the palm of the hand and fingers.

2. Musculo-cutaneus, passes through the musculus coraco brachialis, and after supplying the biceps and brachiaëus internus, is spent on the teguments of the back of the cubitus and hand.

3. Muscularis, runs down the forepart of the arm to be lost in the musculi flexores carpi, digitorum, &c.

4. Ulnaris, which supplies the extensores cubiti, and teguments of the elbow, then passing through the sinuosity at the back of the external condyle of the humerus, runs along the ulna, where it gives twigs to the teguments and neighbouring muscles; at length it is lost in the back of the hand, musculi interossei, and lumbricales, in the little finger, and side of the ring finger and next to this. The course of this nerve is sufficiently felt when we lean on our elbow, by the sensibility and pricking pain in the parts to which it is distributed.

5. Radialis, goes down the forepart of the arm, near the radius, bestowing branches in its progress on the circumjacent muscles, and splitting at the ligamentum annulare carpi, it is sent

to the thumb, fore-finger, middle finger, and half of the ring-finger, and to the back of the hand.

6. Articularis, runs almost round the top of the os humeri, and serves the musculi extensores cubiti, refractores, and elevatores humeri. By a strong and continued pressure on these nerves, by crutches, or any such hard substance, a palsy and atrophy of the arm may be occasioned.

Q. What are the glands of the arm?

A. The axillary glands are situated under the arm-pits, enveloped in fat, and lie close by the axillary vessels about the scapula, and the flexure of the elbow; there are also found here and there some small glands; as also in some places between and among the muscles. Subcutaneous glands, which some mention, have no existence.

DIALOGUE VII.

Of the LEG and its PARTS.

Q. **W**HAT are the parts of the leg?

A. Under the general denomination of the leg and its parts, I shall describe all the lower extremities, and divide them as in the table of osteology and in the skeleton, into the thigh, leg, and foot. The crus ex-

tends from the nates or buttocks to the ends of the toes; and is divided into femur the thigh, from the ischium or hip, to the knee. The fold between the belly and thigh is termed inguen, the groin; the top or fore part of the knee is termed patella, or rotula, the pan of the knee; the hinder part poples, the ham. From the knee to the instep, is properly called the tibia or leg, the forepart of which is crea, the shin; the hinder part fura, the calf; the outer protuberance at the lower end is termed malleolus externus, the outer ancle; on the opposite side is malleolus internus, or inner ancle. The foot is subdivided into three parts, viz. the tarsus, metatarsus, and toes; behind is calcaneus the heel, before is tarsus the instep; from thence to the toes is the metatarsus; the top of the foot is termed dorsum pedis; the under part or sole planta pedis; and the toes digiti pedis.

Q. What are the bones of the leg?

A. As under this denomination I comprehend all the lower limb, as before observed; the bones are, the os femoris, patella, tibia, fibula, tarsus, metatarsus and digiti pedis.

Q. Which is the os femoris?

A. The os femoris is the thigh bone, and the longest and strongest bone of the whole human frame. In its upper extremity is to be observed a very large round head, and in this head a cavity is destined for the ligamentum rotundum, by means of which it is fixed in the acetabulum or socket of the os innominatum, and its luxation upwards prevented. There are two processes

processes or apophyses near the head, called the greater and lesser trochanters, which are evidently formed for the insertion of muscles. The neck of this bone lies between the trochanters and the head, to which is affixed a robust annular ligament, which contains the head and neck of the bone, as it were in a case. The neck is not strait but oblique, nearly horizontal, and turning somewhat outward, so formed for keeping the thighs asunder, by which means we tread the firmer; the spongy cavernous structure of this extremity of the bone, renders it less liable to fractures in this part: the apertures for the ingress of several vessels are also observable, as is the large sinus between the great trochanter and the neck, into which muscles are inserted. The middle of the thigh bone, for the conveniency of the muscles, is a little convex forwards, and somewhat concave backwards, which would make it subject to break backwards, if there was not a strong ridge on the backside (termed *linea aspera*) which strengthens it sufficiently, and serves also for advantageous insertions for several muscles. The great cavity of this bone is also remarkable for containing the marrow. At the lower end of this bone are two large heads, with a cavity between them, for the articulation with the tibia; also a posterior cavity which gives passage for the large vessels to descend securely to the leg. There is besides an inferior cavity for the placing of the patella: and lastly, two condyles, or tubercles, placed near the heads, for the origin of the muscles which move the foot. The

strength and firmness of this bone are surprizingly great ; hence the use of the thigh bone is to support and sustain the weight of the whole body ; and its moveable articulation at the head gives way to the easy motion of the body, while the feet are unmoved. All the processes of the former are cartilaginous in new born children ; and afterwards become small apophyses, with large epiphyses.

Q. Which is the patella ?

A. The patella is a bone which covers the fore part of the joint of the knee, called also rotula, and vulgarly the knee-pan or pan-bone of the knee. It is a convex on the outside, and on the inside unequal, having an eminence and two depressions. Its substance is spongy, and consequently it is brittle. It is connected by tendons and ligaments to the tibia and os femoris, which is the ligament by which it is connected to the thigh, and has a motion of ascent and descent in the flexion of the tibia. Its use is to secure the extensors of the tibia, lest passing over the joint, they might be too much exposed to internal injuries. At the ordinary time of birth, the patella is entirely cartilaginous, and scarcely assumes a bony nature so soon as most epiphyses do.

The part situated from the knee to the ankle is properly called the leg, and consists of two bones besides the patella above mentioned, viz. the tibia and the fibula.

Q. Which is the tibia ?

A. The tibia is the bigger bone of the leg, (so called from its resemblance to an old musical pipe or flute) situated, at its anterior internal
part,

part, and continued in near a strait line, from the thigh-bone to the inner ancle; it is hard and firm with a cavity in its middle; it is almost triangular; its fore and sharp edge is called the skin. This bone is large at its upper end, and has two sinuses or sockets, which receive the two protuberances, or lower heads of the thigh-bone; and the production or process, which is between the sinuses of the tibia, is received in the sinus, or cavity, which divides the two protuberances of the femur before mentioned, and to this rough process of the tibia the cross ligaments of this joint are connected. One side of the upper end has a small process, which is received into a small sinus of the fibula, and on the fore part, a little below the patella, is another process, into which the ligament, or tendon of the patella, is inserted, and the tendons of the extensors of the leg. Its lower extremity, which is much smaller than its upper, has a remarkable process, which forms the inner ancle, and secures this bone from dislocating outwards: it has also a pretty large sinus, which receives the convex head of the astragalus, and the protuberance is received into the sinus, in the convex head of the same bone. It has another shallow sinus in the side of its lower end, which receives the fibula. The upper end of this bone is triangular, as before observed, and even concave on the side next the muscles, to make room for them; but lower as the muscles grow less and tendinous, the bone grows rounder. Both the ends of the tibia are cartilaginous at the birth, and become afterwards epyphyses.

Q. Which

Q. Which is the fibula ?

A. The fibula is the outer and smaller bone of the leg, called also perone. It lies on the outside of the tibia, and its upper end does not reach to the knee, but is only joined to the external side of the tibia, receiving the small lateral process of the upper end of that bone into a small sinus, which the fibula has in its inner side. The lower end of this bone is received into the small sinus of the tibia, and then it extends into a large process, which forms the outward angle, embracing the external side of the astragalus. Thus the inferior processes of the tibia and fibula concur in the articulation of the tarsus, which serves to strengthen the ankle joint, and render a luxation less easy. The tibia and fibula do not touch one another but at their ends; the space which they leave in the middle is filled up by a strong membranous ligament, and some muscles, which extend the feet and toes. The fibula has no particular motion of its own, but wholly follows that of the tibia; and it seems doubtful, whether or not this bone contributes to the support of the body: its great use is for the origin of the muscles, and even its shape is suited to theirs. The body of this bone is a little crooked inwards and backwards, which figure is owing to the actions of the muscles, but is still further increased by nurses, who often hold children carelessly by their legs. Both the ends of the fibula are cartilaginous in a ripe child, and assume the form of appendices before they are united to its body.

The

The bones of the feet are those of the tarsus, metatarsus, and toes.

Q. Which is the tarsus, and of what bones does it consist?

A. The tarsus is the space between the bones of the leg and the metatarsus, consisting of seven spongy bones, viz. the astragalus or talus; calcaneum or os calcis; os naviculare; os cuboides vel cubiforme; and the three ossa cuneiformia. The first of these bones, which is the astragalus, supports the tibia, and is supported by the os calcis, which being projected backwards, makes a long lever for the muscles to act with, that extend the ankle and raise the body upon the toes. These two bones have a considerable motion between themselves, and the astragalus also with the os naviculare, and all the rest an obscure motion one with another, and with the bones of the metatarsus; the greatest part of these motions being toward the great toe, where is the greatest stress of action. These bones thus giving way are less liable to be broke, and as a spring under the leg, make the motions of the body, in walking, more easy and graceful, and the bones which are supported by them less subject to be fractured in violent actions. The os naviculare is in the middle of the internal side of the tarsus.

The os cuboides is the most external of the row of four bones at its fore part. The os cuneiforme externum is placed at the inside of the cuboid. The cuneiforme medium is between the external and internal cuneiforme bones; and the

the internal cuneiforme is put at the internal side of the foot.

Q. Which is the metatarsus, and of how many bones is it composed?

A. The metatarsus is the space between the tarsus and toes, consisting of five bones, articulated to the tarsus at one end, and to the toes at the other; the metatarsal bone which supports the great toe is much the largest, the greatest stress in walking falling upon that part; under the end of this lie the two sesamoid bones, which are of the same use as the patella.

Q. What are the *digiti pedis*, and how are they composed?

A. The *digiti pedis* is a term given by anatomists to the toes. Each of the toes, except the great one, consists of three phalanges; the great toe has but two, and the two last of the little toe frequently grow together. The toes are less than the fingers, and have much less free motion.

Q. What are the sesamoidal bones?

A. The *ossa sesamoidea*, are of very different figures and sizes, though they are generally said to resemble the seed of the *sesamum*. They seem to be no other than the ligaments of the articulations, or the firm tendons of strong muscles, or both, become bony by the compression which they suffer. Thus the sesamoid bones at the beginning of the *gastrocnemii* muscles, are evidently composed of the tendinous fibres only. These at the first joint of the great toe are as plainly the same continued substance with the
ligaments

ligaments and the tendons of the abductor, flexor, brevis, and abductor. That which is sometimes double at the second joint of that toe is part of the capsular ligament; and if we enumerate the other sesamoid bones that are at any time found, we may observe all of them formed in this manner. Their number, figure, situation, and magnitude, are so uncertain, that it were in vain to insist on the differences of each, and therefore we may in general remark,

1. That, wherever the tendons and ligaments are firmest, the actions of the muscles strongest, and the compression greatest, there such bones are most commonly found.

2. That, *cæteris paribus*, the older the subject is in which they are sought, their number is greater, and their size larger.

3. The more labour any person is inured to, he has, *cæteris paribus*, the most numerous and largest ossa sesamoidea.

However, as the two at the first joint of the great toe are much larger than any other, are early formed, and are seldom wanting in an adult, we may judge that, besides the more forcible cause of their formation, there should also be some particular advantage necessary at this place rather than elsewhere; which may possibly be, to allow the flexor muscles to send their tendons along this joint, secure from compression in the hollow between the two oblong sesamoid bones; while, by removing these tendons from the centre of motion, and giving them the advantage of an angle at their insertion, the force of the muscle is increased, and
therefore

therefore the great super incumbent weight of our body in progression is more easily raised.

Q. What are the cartilages of the leg ?

A. The cartilages of the lower extremity are those of the os femoris, patella, tibia, fibula, and bones of the foot.

Q. What are the cartilages of the os femoris ?

A. No part of the os femoris is covered with a cartilage, except the uniform convexity of the head, and the articular portion of the lower extremity : the trochanters in adults have no true cartilage.

Q. What cartilage has the patella ?

A. The patella has a pretty thick cartilage on its posterior or articular side.

Q. What are the cartilages of the tibia ?

A. The tibia has four or five proper cartilages and two additional ones ; the former are those of the two superior surfaces of the head of the tibia, that which covers the small surface on the lower part of the external condyle ; also that which covers the lower surface of the basis of the tibia, continued over the outside of the inner angle ; and there are likewise superficial cartilaginous incrustations on the back part of both angles for the passage of tendons. The additional cartilages of the tibia are two in number, called semi-lunar or inter-articular, in the shape of a C. they lie on the two upper surfaces of the head of the tibia.

Q. What cartilages has the fibula ?

A. Two ; one lying on the upper extremity
of

of that bone, the other covers the inside of the inferior extremity, or of the outer angle.

Q. What are the cartilages of the bones of the foot.

A. The astragalus is covered by three cartilages; the first of these is for the articulation of this bone with the tibia and fibula; the second for the os calcis; and the third for the os sca-phoides vel naviculare. The os calcis has four cartilages, of which three are superior, one large and two small, for its triple articulation with the astragalus; the fourth is anterior, for the os cuboides. The os naviculare has two cartilages, one posterior for its articulation with the astragalus; and one anterior, divided into three parts for the three ossa cuneiformia. The os cuboides has two remarkable cartilages, one posterior for its articulation with the os calcis, and one anterior for its articulation with the two last metacarpal bones: it has likewise a cartilage on the inside for the os cuneiforme, which is next to it, and one on the lower side. The three ossa cuneiformia have each of them a posterior cartilage for their articulations with the os naviculare; and one anterior, for the three first metacarpal bones; they have likewise small cartilaginous surfaces on their sides, for their articulations with each other; and besides, the first and third bones are joined thereby to the lateral parts of the basis of the second metatarsal bone, and the third to the os cuboides. The bases and heads of the metatarsal bones are covered with cartilages. The phalanges have cartilages in the same manner at their bases and heads, except

cept at the heads or extremities of the last. We should beware of confounding the remains of tendons, ligaments, and aponeuroses with true cartilages, as for instance, at the posterior part of the os calcis, &c.

Q. What are the ligaments of the leg ?

A. The ligaments of the lower extremity are those of the os femoris, patella, tibia, fibula, and bones of the foot.

Q. What are the ligaments of the os femoris ?

A. The os femoris is connected by its upper extremity to the os innominatum, and by the lower to the bones of the leg, by means of several ligaments. The ligaments of the upper extremity are two in number; one surrounds the whole articulation, with the cotyloide cavity, or acetabulum, and one is contained in the articulation. To these we may, though very improperly, add a third, which is of the nature of a capsular ligament. The first is termed the orbicular ligament of the head of the os femoris, and is the most considerable, largest, and strongest of all the articular ligaments of the human body: it is fixed quite round the border of the acetabulum, or cotyloide cavity, as before observed; and from thence largely surrounds the whole head and superior portion of the neck of the os femoris, in the lower part of which neck it is closely inserted. The other ligament of the head of the os femoris, which lies in the joint, I call internal, and inter-articular. It resembles a flat cord, broad at one end, and narrow at the other;

other; by its narrow end, it is inserted at the two angles of the notch of the cotyloide cavity, and by the other in the os femoris, these being a sort of depression in the head of the bone for the passage of the ligament. The ligaments of the lower extremity of the os femoris, by which this bone is connected with those of the leg, are six in number, viz. one posterior, two lateral, two middle or crucial, and one capsular. The crucial ligaments lie within the joint, and are fixed by one end to the back part of the notch or opening, which parts the two condyles; they are surrounded by the capsular ligament, but all the rest lie on the outside thereof, being closely joined to it. The two lateral ligaments are fixed one to each tuberosity of the condyles. The posterior ligament is fixed a little above the convexity of the external condyle, from whence it descends obliquely behind the great notch and internal condyle. The capsular ligament glued as it were, to the three former, is fixed quite round the inferior extremity of the os femoris, just above the cartilage, and the posterior part of the great notch; and from the cartilage and notch, through the small space upward, already mentioned, it covers the bone; and afterwards is inverted downward, to form the capsula for the mucilaginous liquor of the joint. What remains to be described of all these ligaments, I shall refer to the description of those of the leg.

Q. What are the ligaments of the patella?

X

A. The

A. The patella is fastened to the tuberosity or spine of the tibia by a broad and very strong ligament, which runs down directly from the apex of the patella; it has likewise small lateral ligaments, fixed in the lower part of its edge on each side, which are inserted anteriorly, and a little laterally in the edge of the head of the tibia. The capsular ligament of the joint of the knee, of which I described one part in speaking of the lower extremity of the os femoris, is fixed round the edge of the head of the tibia, and in the edge of the patella, so that the patella itself forms a portion of the mucilaginous capsula of the joint of the knee. The crucial ligaments and those of the semilunar cartilages, are included within this capsula; but the lateral and posterior ligaments, and those of the patella, lie without it, being closely joined to its outer surface; this capsula is likewise joined to a considerable portion of the circumference of the semilunar cartilages; and it not only contains and surrounds the ligaments already named, but likewise furnishes them with a very fine vagina. There is likewise a very thin ligament fixed by one end to the lower part of the cartilaginous side of the patella, and by the other to the anterior part of the great notch, between the condyles of the os femoris, the use of which seems to be to hinder the articular fat from being compressed in the motions of the knee.

Q. What are the ligaments of the tibia?

A. I have already observed, that the tibia is connected with the os femoris by several ligaments,

ments, two lateral, one posterior, two middle, and one capsular; and I have shewn in what manner they are fixed in the lower extremity of the os femoris and patella. Their insertion in the bones of the leg are as follows. The innermost of the two lateral ligaments is fixed pretty low down, on the inner side of the superior part of the tibia. The external lateral ligament is fixed in the upper extremity of both tibia and fibula; both are joined to the edge of the semilunar cartilages, and lie a little behind the middle of the articulation. The posterior ligament is fixed by several expansions in the posterior part of the head of the tibia. One of the crucial ligaments is fixed by one end to the internal superficial impression in the notch of the os femoris, and, by the other, to the notch in the head behind the cartilaginous tubercle, which lies between the two superior surfaces. The other crucial ligament is fixed by one end to the external impression in the notch of the os femoris, and, by the other, between the anterior portion of the surfaces just mentioned. There are several other small ligaments, but these are the principal ones.

Q. What are the ligaments of the fibula?

A. The fibula is joined to the tibia by nine ligaments, four at each end, and one in the middle, called the interosseous ligament. The ligaments at the upper extremity of the fibula are short, very strong, more or less oblique and compound; two of them are anterior, two posterior, and they lie on each other; the superior ligaments surrounding the articulation more

closely than the inferior. They are all glued to the capsular ligament, which runs in between them and the articulation, and they are inserted round the edges of the cartilaginous surfaces in each bone. The ligaments of the lower extremity of the fibula are disposed much after the same manner, that is, two before, and two behind; which run down on the lower end of the fibula forming the outer angle. The middle space between the tibia and fibula is filled by a sort of capsular ligament, which lines each side of the bones, down to the external angle, with the inferior edge of the basis of the tibia. The middle or interosseous ligament of the two bones of the leg, so called because it fills up all the space left between them, being stretched from one to the other. It is perforated both above and below, and sometimes in several places besides, for the passage of the blood vessels and nerves. It is not a ligament designed to tie these bones together, but rather a ligamentary septum for the insertion of muscles, in which respect it supplies the place of bones; and seems partly to be a continuation of the periosteum of the tibia and fibula. At the lower part of each angle there are commonly three strong ligaments for the connexion of the bones of the tarsus with these of the leg, one that runs forwards, one backwards, and one more or less directly downward. The other ligamentary expansions and annular ligaments of this part, as they do not belong to the bones, will be mentioned in their proper place.

Q. What

- Q. What are the ligaments of the foot?

A. The foot being made up of many bones, must, besides those ligaments by which it is tied to the bones of the leg, have several others to connect not only the three parts of which it is composed, but also the particular bones belonging to each part. I have already mentioned the insertion of three ligaments in each ankle for the articulation of the ankles with the foot. The ligaments of the inner ankle are all fixed in the inside of the astragalus. The anterior and middle ligaments of the outer ankle are fixed in the outside of the astragalus; the posterior is chiefly fixed in the outside of the os calcis. All these ligaments lie on the outside of the capsula, which surrounds the articulation of the astragalus with the bones of the leg. The ligaments by which the bones of the tarsus are connected with each other, are short, flat, of different breadths, and run from one bone to another in various directions. The capsular ligaments of these bones go very little further than the edges of the articulations of one bone with another; they adhere very closely to the true ligaments, and are covered and tied by them. The os cuboides and the three ossa cuneiformia, are also connected to the metatarsal bones, by several particular ligaments. The bones of the metatarsus are connected together by their bases and heads. The first phalanges of the toes are tied to the heads of the metatarsal bones, by a sort of orbicular ligament, set round the edges of the cartilagi-

nous portions of the head, and those of the bases of the phalanges. The second and third phalanges of all the toes, being articulated by ginglymi, have lateral ligaments, which go between the sides of the bases to the sides of the heads. The capsular ligaments of all these articulations are disposed like those of the tarsus already spoken of. See the muscles of the foot.

Q. What are the mucilaginous glands of the leg?

A. The mucilaginous glands of the lower extremity lie in the small spaces, depressions, and superficial notches near the edges of the cartilages of each joint; they are covered by the capsular ligaments, and more or less mixed with a fatty substance. The glands of the knee, which lie near the edges of the patella, are the most considerable, being disposed of in form of fringes, and supported by a great quantity of fatty matter, which makes in some measure one mass with them, and is contained within the capsular ligaments. There are other mucilaginous glands, both above and below the edges of the femilunar cartilages; and likewise in the ham, some whereof serve for the joint, the rest for the crucial ligaments. These last lie in folds formed by the internal membrane of the capsular ligament, which give particular coverings to the crucial ligaments. The mucilaginous glands of the foot answer in number and figure to the depressions between the cartilaginous edges and ligaments.

Q. What are the muscles of the leg?

A. The muscles of the lower extremities are the

the psoas magnus, iliacus internus, pectinæus, triceps femoris, glutæus maximus, glutæus medius, glutæus minimus, pyriformis, quadratus femoris, obturator internus et externus, fascia lata, gracilis, sartorius, semitendinosus, semimembranosus, biceps, tibiæ, popliteus, rectus tibiæ, vastus externus et internus, cruræus, gastrocnemius, plantaris, solæus, tibialis anticus, et posticus, peroneus longus et brevis, extensor pollicis pedis longus et brevis, flexor pollicis pedis longus et brevis, abductor pollicis pedis, do. transversalis, extensor digitorum pedis longus et brevis, flexor digitorum pedis brevis vel perforatus, flexor digitorum pedis longus vel perforans lumbricales pedis, abductor minimi digiti pedis, abductor secundus minimi digiti pedis et interossei pedis.

Q. Which is the psoas magnus ?

A. The psoas magnus is a long thick muscle, situated in the abdomen, on the lumbar region, adhering to the vertebræ of the loins, from the posterior part of the os ilium to the anterior part of the thigh. It arises laterally from the bodies and transverse processes of the four superior vertebræ of the loins, and the last of the back; and is inserted with the following muscle into the lesser trochanter. This is one of the flexor muscles of the thigh, and when the psoas parvus is wanting, this is larger.

Q. Which is the iliacus internus ?

A. The iliacus internus arises from the internal concave part of the os ilium, and from its lower edge; it is inserted with the psoas magnus, and employed in the same action. These move the thigh forward in walking.

Q. Which is the *pectinæus*?

A. The *pectinæus* is a small, flat and pretty long muscle, situated obliquely between the *os pubis* and the upper part of the *os femoris*. It arises from the *os pubis* or *pectinis*, near the joining of that bone with its fellow, and is inserted into the *linea aspera* of the thigh-bone, four fingers breadth below the lesser trochanter. This bends the thigh and turns the toes outward.

Q. Which is the *triceps femoris*?

A. The *triceps femoris* is the adductor muscle of the thigh, having three heads and as many insertions; two arise under the *pectineus*, and a third from the *os pubis* and *ischium*; and are inserted into the whole *linea aspera* and the inner apophysis of the *os femoris*. This also bends the thigh and turns the toes outward.

Q. Which is the *glutæus maximus*?

A. The *glutæus maximus* arises from the *os coccygis*, the spine of the sacrum and adjoining parts; and is inserted by a strong tendon into the upper part of the *linea aspera* of the *os femoris*, four fingers breadth below the great trochanter. This extends the thigh, and both these together being contracted, occasionally assist the levatores ani in supporting the anus.

Q. Which is the *glutæus medius*?

A. The *glutæus medius* ariseth under the former from the spine of the ilium, and is inserted into the superior and external parts of the great trochanter of the *os femoris*. This extends the thigh outward.

Q. Which is the *glutæus minimus*?

A. The *glutæus minimus* arises from the ilium under the former, and is inserted into
great

the superior and anterior part of the great trochanter, and neck of the thigh-bone, to extend the thigh. These three muscles form the buttocks.

Q. Which is the *pyriformis*?

A. The *pyriformis*, vel *iliacus externus*, arises from the inside of the lower part of the *os sacrum*, and from thence it runs transversely towards the joint of the hip, and is inserted into the upper part of the sinus, at the root of the great trochanter.—This assists somewhat in extending the thigh, but more in turning it outward.

Q. Which is the *quadratus femoris*?

A. The *quadratus femoris* is situated transversely between the tuberosity of the *ischium*, and the great trochanter. It arises from the obtuse process of the *ischium*, and is inserted into the upper part of the *linea aspera* of the *os femoris*, between the two trochanters. This draws the thigh inward, and directs the toes outward.

Q. Which is the *obturator internus*?

A. The *obturator internus*, vel *marfupialis*, arises from the internal circumference of the hole that is between the *ischium* and the *os pubis*, and is inserted into the sinus of the great trochanter. This turns the thigh outward.

Q. Which is the *obturator externus*?

A. The *obturator externus* arises opposite to the former, from the external circumference of the same hole; and is also inserted into the sinus of the great trochanter. This also turns the thigh outward.

These four last-mentioned muscles acting with the extensors, prevent their turning the toes
inward

inward, and in stepping forwards are continually acting to turn the toes outward.

Q. Which is the fascia lata ?

A. The fascia lata vel abductor fascialis femoris, called also musculus membranofus, arises from the fore part of the spine of the ilium. Soon after its origin it becomes entirely membranous, and closely surrounds the muscles of the thigh ; after which it is inserted in the upper part of the tibia, near the head of the fibula, and from thence sends out an aponeurosis, almost over the whole external muscles of the tibia, as those of the thigh bone. About the middle of the leg it grows loose, and is so continued to the top of the foot, being connected there, and at the lower part of the leg, to the annular ligaments which tie down the tendons. When this muscle acts, the leg and thigh are drawn outwards ; it also helps to extend the joints of the knee, and to elevate both the thigh and leg.

All these muscles I have now mentioned serve to move the os femoris on the pelvis.

Q. Which is the gracilis ?

A. The gracilis arises from the os pubis, close to the penis, and descending by the inside of the thigh, is inserted into the inside of the tibia, near the sartorius, four or five fingers breadth below the joint of the knee. This muscle draws the leg and thigh inwards, and helps to bend the knee.

Q. Which is the sartorius ?

A. The sartorius is both an abductor and elevator, serving to move the legs upwards and forwards

forwards, and to cross each other as taylor's sit with them, whence the name; it arises from the ilium, and descending obliquely is inserted into the upper and inner part of the tibia, four or five fingers breadth below the point of the knee. This is the longest muscle in the human body.

Q. Which is the semi-tendinosus?

A. The semi-tendinosus vel semi-nervosus arises from the ischium, and is inserted into the upper part of the tibia, near the gracilis and sartorius. It helps to bend the leg and extend the thigh.

Q. Which is the semi-membranosus?

A. The semi-membranosus is a long thin muscle, partly tendinous, whence its name, situated on the backside of the thigh, a little towards the inside, being one of the five flexors of the tibia. It arises from the ischium a little above the semi-nervosus, and is inserted into the upper part of the tibia, but nearer the joint than the former muscle for the same use. Before it is inserted, it sends off sometimes an aponeurosis-like that of the biceps. The semi-tendinosus and semimembranosus make the internal ham string.

Q. Which is the biceps tibiæ?

A. The biceps tibiæ, vel femoris, is a muscle with two heads, the superior from the ischium, the other from the linea aspera of the os femoris: both which join together, and are inserted by one tendon into the superior and external part of the fibula, to bend the leg, and the first head also extends the thigh. The tendon

don of this muscle froms the external ham string, when the knee is bent; besides the office commonly assigned to this muscle, in bending the tibia together with the sartorius and membranofus, it is likewise employed in turning the leg, together with the foot and toes outwards, when we sit down with the knees bended.

Q. Which is the popliteus?

A. The popliteus is a small muscle obliquely pyramidal, situated under the ham, from whence its name. It arises from the outer apophysis of the os femoris, and thence running obliquely inward, is inserted into the backside of the head of the tibia. It assists the flexors, and draws the tibia towards the outer apophysis of the thigh bone.

Q. Which is the rectus tibiæ?

A. The rectus tibiæ, vel cruris, arises from the upper part of the acetabulum of the os innominatum, and from the processus inominatus of the ilium, and is inserted together with the three following muscles into the patella. It bends the thigh and extends the tibia.

Q. Which is the vastus externus?

A. The vastus externus is a very large fleshy muscle, almost as long as the os femoris, lying on the outside of the thigh. It arises from the fore part of the great trochanter, and superior part of the linea aspera of the os femoris, and is inserted into the upper and external part of the patella. This muscle extends the tibia.

Q. Which is the vastus internus?

A. The

A. The vastus internus is very like the former, and situated in the same manner, on the inside of the os femoris. It arises from the linea aspera, and is inserted into the patella, to extend the tibia; and the fibres of this muscle being oblique, it keeps the patella in its place.

Q. Which is the cruræus?

A. The cruræus arises from the fore part of the thigh bone between the two trochanters, and lying close upon the bone, it joins its tendon with the three former muscles, which are inserted into the patella, the patella being tied down by a strong ligament to the tibia.

These three last muscles extend the tibia only, and might very properly be called extensor tibiæ triceps.

These ten muscles not only move the leg upon the thigh, but also the thigh upon the leg, the popliteus excepted.

Q. Which is the gastrocnemius?

A. The gastrocnemius is a pretty thick, broad and oblong muscle, which forms a great part of the calf of the leg. It arises from the posterior part of the os femoris, which soon becoming large bellies, unite, and then form a flat tendon, which joins the following muscles to be inserted into the os calcis. Its use is to extend the tarsus and bend the knee.

Q. Which is the plantaris?

A. The plantaris arises from the external condyle of the os femoris. under the outer beginning of the gastrocnemius in the ham, and soon forming a small tendon is so continued betwixt the foregoing and subsequent muscles,
and

and is inserted with them. It bends the knee and extends the tarsus.

Q. Which is the *solæus*?

A. The *solæus vel gastrocnemius internus*, arises from the upper part of the tibia, and one third of the fibula below the popliteus, and is inserted with the two foregoing muscles by a strong tendon into the upper and back part of the os calcis. This muscle only extends the tarsus.

Q. Which is the *tibialis anticus*?

A. The *tibialis anticus* is situated on the fore side of the leg, and is one of the flexor muscles; it arises from the tibia, and is inserted laterally into the internal os cuneiforme and the internal metatarsal bone. This bends and turns the tarsus inward.

Q. Which is the *tibialis posticus*?

A. The *tibialis posticus*, or abductor muscle of the foot, arises in the upper part of the tibia between that bone and the fibula, and going between the bones through a perforation in the interosseous ligament, it passes under the inner angle, and is inserted into the os naviculare. It extends and turns inward the tarsus.

Q. Which is the *peroneus longus*?

A. The *peroneus longus* arises from the external and superior part of the fibula, and its tendon passing under the outer angle and the muscles situated on the bottom of the foot, is inserted into the beginning of the metatarsal bone of the great toe, and the os cuneiforme next that bone. This turns the tarsus outward, and directs the force of the other extensors

fors of the tarsus toward the ball of the great toe.

Q. Which is the peroneus brevis?

A. The peroneus brevis arises from the middle of the fibula, under a part of the former, passes under the outer angle, and is inserted into the os metatarsi of the little toe. Its use is to extend the tarsus and turn it outward.

These two last muscles, riding over the lower end of the fibula, are often the cause of a sprain in the outward angle, when they are vehemently exerted to save a fall. These seven muscles (which Winslow divides into nine) serve to move the tarsus and foot on the leg.

Q. Which is the extensor pollicis pedis longus?

A. The extensor pollicis pedis longus arises from the upper and fore part of the fibula, and the interosseous ligaments, and is inserted into the last bone of the great toe. This also bends the tarsus with a much longer lever than it extends the toe.

Q. Which is the extensor pollicis pedis brevis?

A. The extensor pollicis pedis brevis, arises from the fore part of the os calcis, and soon becoming a long slender tendon, it passes obliquely over the upper part of the foot, and is inserted into the same place with the former.

Q. Which is the flexor pollicis pedis longus?

A. The flexor pollicis pedis longus, is an antagonist to the extensor longus, arising opposite to it from the back part of the fibula, and its tendon passing under the inner angle, is inserted

inserted into the last bone of the great toe. This extends the tarsus, as well as bends the toe.

Q. Which is the flexor pollicis pedis brevis?

A. The flexor pollicis pedis brevis arises from the two lesser ossa cuneiformia, the os cuboides and os calcis. This muscle is inserted into the ossa sesamoidea, which are tied by a ligament to the first bone of the great toe, reckoning only two bones to the great toe. These muscles bend the great toe.

Q. Which is the abductor pollicis pedis?

A. The abductor pollicis pedis arises from the os calcis and os naviculare, and passing by the os cuneiforme majus, and the external sesamoid bone of the great toe, it is inserted into the first bone of the great toe. This muscle is less an abductor than a flexor; it also very much helps to constrict the foot length ways.

Q. Which is the abductor pollicis pedis transversalis?

A. The abductor pollicis pedis transversalis arises from the lower end of the metatarsal bone of the toe next the least, and is inserted into the internal sesamoid bone. This truly is an abductor of the great toe, and helps to keep the constrictor of the bottom of the foot.

Q. Which is the extensor digitorum pedis longus?

A. The extensor digitorum pedis longus arises from the upper part of the tibia, and from the fibula and interosseous ligaments, then dividing into five tendons: four of them are inserted into the second bone of each lesser toe, and

and the fifth into the beginning of the metatarsal bone of the least toe. The four first tendons only of this muscle extend the toes, but the whole five bend the tarsus.

Q. Which is the extensor digitorum brevis?

A. The extensor digitorum brevis arises, together with the extensor pollicis brevis, from the os calcis, and dividing into three small tendons, is inserted into the second joint of the three toes next the great one.

The long extensors of the toes serve not only to extend them, but also contribute to the bending of the ankle; but the short extensors arising below the ankle, extend the toes only.

Q. Which is the flexor digitorum pedis brevis, vel perforatus pedis?

A. The flexor digitorum pedis brevis, vel perforatus pedis, is the flexor of the second phalanx, and is the inmost of all the common muscles of the toes. It arises from the under and back part of the os calcis, thence passing towards the four lesser toes, divided into four tendons, which are inserted into the beginning of the second bone or phalanx of each of the lesser toes. These tendons are divided or perforated to let through the tendons of the following muscles.

Q. Which is the flexor digitorum pedis longus, vel perforans?

A. The flexor digitorum pedis longus, vel perforans, is the flexor of the third phalanx. It rises from the back part of the tibia, above the insertion of the popliteus, and part of the fibula; thence descending under the os calcis to the bottom

of the foot, it there becomes tendinous, often crosses, and in most bodies communicates with the flexor longus pollicis pedis; then it divides into four tendons, which pass through those of the flexor brevis, and are inserted into the third bone of the four lesser toes. This muscle also extends the tarsus.

The second beginning of this muscle arises from the os calcis, and joins the tendons where they divide. This portion only bends the toes.

Q. Which is the lumbricales pedis?

A. The lumbricales pedis are the flexors of the first phalanx, and arise from the tendons of the perforans; they are inserted into the first bone of each of these lesser toes, which they bend.

Q. Which is the abductor minimi digiti pedis?

A. The abductor minimi digiti pedis arises by the perforatus from the os calcis, and being part of it inserted into the metatarsal bone of the least toe, it receives another beginning from the os cuboides, and is inserted into the first bone of the least toe, which it bends and pulls outward, and very much helps to constrict the bottom of the foot.

Q. Which is the abductor secundus minimi digiti pedis?

A. The abductor secundus minimi digiti pedis, arises under the former muscle from the metatarsal bone, and is inserted into the little toe.

Q. What are the interossei pedis?

A. The

A. The *interossei pedis* are seven muscles like those of the hands, arising like them from the metatarsal bones, and are inserted into the last joints of the four lesser toes; being in their progress attached to the tendons, which extend the second joints of the toes, they will extend both these joints. These muscles may be fitly divided into external and internal; the internal also bend the first joints, as do all the *interossei* in the hand; but here the outer ones extend the first joints. The muscles that move the fingers and lesser toes sideways, are alike in number, though this motion of the toes is in a manner lost from the use of shoes. The muscles that bend or extend the last joints of the toes, will also move the second and first, and those that move the second will also move the first, as they do the fingers.

Q. What are the arteries of the leg?

A. The arteries of the thigh, leg, and foot, are, the *arteria cruralis*, *pudica externa*, *poplitea*, *tibialis*, *anterior et posterior*, *vel suralis*, *plantaris externa et interna*, and *peronæa*.

A. Which is the *arteria cruralis*?

A. The iliac artery (which see) goes out of the abdomen, between the *ligamentum Fallopii* and tendon of the *psoas*, at the union of the *os ilium* and *os pubis*, and there it takes the name of *arteria cruralis*. It sends off, first of all, three small branches; one of which, called *pudica externa*, goes over the crural vein to the skin and ligament of the penis, and to the inguinal glands, communicating with the *pudica interna*. The second branch goes to the *musculus*

pectineus: and the third, to the upper part of the sartorius. All these branches furnish likewise the neighbouring anterior integuments. Afterwards the crural artery runs down on the head of the os femoris, and gets on the inside of the crural vein, about three fingers breadth from where it goes out of the abdomen. In this progress it is covered only by the skin and fat, and lies on the pectineus and triceps femoris. In changing its situation, it sends out the three following considerable branches: the external branch runs on the upper side of the thigh to the crureus vastus externus, rectus tibiæ, fascia lata, and glutæus medius. The middle branch runs down on the inside of the thigh, between the heads of the triceps, to which muscle it is distributed, a ramification of which perforates the triceps, and is distributed to the glutæus maximus, semitendinosus, semimembranosus, biceps, and to the neighbouring integuments. The internal branch runs backward on the quadrigemini, towards the great trochanter; and having sent a branch into the joint of the os femoris, it then runs downward, and is ramified on all the muscles that lie on the backside of that bone, one of which enters the bone itself on one side of the linea aspera.—The arteria cruralis having detached all these branches runs down between the sartorius, vastus internus, and triceps, giving branches to all the parts near it. It is covered by the sartorius all the way to the lower part of the thigh, where it is inflected backward over the triceps a little above the internal condyle of the os femoris.

Afterward

Afterward continuing its course through the hollow of the ham, it is called poplitea.

Q. How is the arteria poplitea distributed?

A. The arteria poplitea, while in the ham, is covered only by the integument, sending off branches toward each side, some to the joint of the knee, one of which, at least, passes between the crucial ligaments. As it runs down it sends branches to the gastrocnemii and popliteus; and at the backside of the head of the tibia, sends off a branch to each side. Before the poplitea ends, it sends a small artery down on the backside of the interosseous ligament, very near the tibia, into which it enters by a particular hole a little above the middle portion of the bone. As the poplitea ends, it divides into two principal branches, one of which runs between the heads of the tibia and fibula, passing from behind forwards on the interosseous ligament, where it takes the name of tibialis anterior. The second branch divides into two others, the internal and largest called tibialis posterior; the other named peronæa posterior.

Q. How is the arteria tibialis anterior distributed?

A. The arteria tibialis anterior, having passed between the heads of the tibia and fibula, sends small branches upward and laterally. Afterwards this tibial artery runs down on the fore side of the interosseous ligament, toward the outside of the tibia, between the musculus tibialis anticus and extensor pollicis, for about two thirds of the length of the tibia, when it passes on the fore side, under the common annular liga-

ment, and extensor pollicis pedis, to the articulation of the foot; which giving off several branches to the right and left, and communicating with the tibialis posterior and peronæa posterior, so that these two are in a manner surrounded by arteries. At the joint of the foot it sends out branches, which run between the astragalus and os calcis, being distributed to the articulation and to the bones of the tarsus: the communications are here very numerous on all sides. Having passed the fold of the foot it sends off other branches on both sides, which communicating with others, make a kind of circle round the tarsus. Afterwards the tibialis anterior advances on the convex side of the foot, as far as the interstice between the first and second metatarsal bones; between the heads of which, a large branch of it perforates the superior interosseous muscles, and forms an arch on the side of the foot. It likewise sends two or three considerable branches over the other metatarsal bones. Lastly, this artery terminates by two principal branches, one of which goes to the thenar, and inside of the great toe; the other is spent upon the outside of the great toe, and the middle of the second toe.

Q. How is the tibialis posterior, vel furalis, distributed?

A. The tibialis posterior, vel furalis, proceeding from the poplitea, as before observed, runs down between the solæi, tibialis posticus flexor digitorum communis and flexor pollicis, giving branches to these muscles, to the tibia, and to the marrow of that bone, through a particular canal

canal in its posterior and upper part. Afterwards it runs behind the inner angle, communicating with the tibialis anterior, then passes to the sole of the foot, and divides into two branches, one large or external, and the other small or internal, called *plantaris externa*, et *plantaris interna*.

The great branch, or *plantaris externa*, passes on the concave side of the *os calcis*, obliquely under the sole of the foot, to the basis of the fifth metatarsal bone, and from thence runs in a kind of arch toward the great toe: the convex side of this arch supplies both sides of the last three toes, and the outside of the second toe, forming small communicating arches at the end and sometimes at the middle of each toe, as in the hand. The concave side of the arch furnishes the neighbouring parts.

The small branch, or *arteria plantaris interna* having reached beyond the middle of the sole of the foot, is divided into two; one goes to the great toe, the other to the first phalanges of the other toes, communicating with the ramifications from the arch already mentioned.

Q. How is the *peronæa* distributed?

A. The *arteria peronæa*, proceeding from the *poplitea* as before mentioned, runs down on the backside of the fibula, between the *solæus* and *flexor pollicis*, to which, and to the neighbouring parts, it gives branches in its passage all the way down to the *os calcis*, where it forms an arch with the *tibialis posterior*, between the *astragalus* and the *tendo achillis*; and from thence it runs outward, and a little above the outer an-

anle communicates with the tibialis anterior by an arch, which sends several ramifications to the neighbouring parts.

In the description of the arteries throughout this work, I have said nothing of the cutaneous anastomoses, which are exceedingly beautiful in the fœtus ; nor of the frequent and considerable communications of small arteries upon the periosteum, which form a delicate kind of network.

Q. What are the veins of the leg ?

A. The veins of the thigh, leg, and foot are the vena cruralis, saphena, sciatica, saphena minor, poplitea, tibialis anterior et posterior, vel furialis, plantares, and peronea.

Q. Which is the crural vein ?

A. The vena cruralis goes out under the ligamentum Fallopii, on the inside of the crural artery, and immediately gives small branches to the inguinal glands, musculus pectineus, and parts of generation, which last are termed pudicæ externæ. About an inch below where it leaves the abdomen, it produces a large branch, which runs down anteriorly between the integuments and the sartorius almost all the way to the inside of the thigh, and from the condyles of the os femoris, it runs between the integuments and inner angle of the tibia to the fore part of the inner ancle, and is distributed to the foot under the name of vena saphena, or saphena major. After giving out the saphena, the cruralis sinks in between the muscles, and is distributed to all the inner or deep parts of the lower extremity, accompanying the crural artery

to

the very extremity of the foot, being all along more considerable than the artery

Q. How is the vena saphena, or saphena major distributed ?

A. The saphena major, arising from the cruralis, as before-mentioned, in its passage from the inguen to the foot, is covered only by the skin and fat; and after supplying the inferior inguinal glands and integuments, it runs down on the thigh as low as the middle of the sartorius, where it sends off several branches; and a little below the ham it runs in among the muscles situated there, and communicates with another branch, which may be termed saphena minor. Afterwards the trunk of the great saphena runs down on the inside of the tibia, lying always near the skin; and at the upper part of that bone, it sends branches forward, outward, and backward. The anterior branches go to the integuments on the upper part of the leg; the posterior, to those which cover the gasteronocnemii, and the external branches also to the fat and integuments. About the middle of the tibia, it gives out a branch anteriorly, which runs along the integuments of the tibia all the way to the outer ancle; and as the saphena runs down on the inside of the tibia, it sends off branches to the neighbouring parts, and to the periosteum of the bone. At the lower part of the tibia, the saphena sends out a considerable branch obliquely forward over the joint of the tarsus, toward the outer ancle, sending off several branches. Lastly, the extremity of this trunk passes on the fore-side of the inner ancle, and runs under the skin

skin along the interstice between the first two metatarsal bones toward the great toe, where the vein terminates ; but before it terminates at the great toe, it forms a kind of arch over the metatarsus, which communicates by several branches with the arch on the joint of the tarsus, and sends others to the toes.

Q. Which is the vena sciatica ?

A. The sciatic vein arises from the crural, about the upper extremity of the musculus vastus internus, and runs down on the side of the crural trunk, covering the crural artery, almost as low as the ham, where it is again united to the trunk by an anastomosis. It has the name of sciatica from the sciatic nerve which it accompanies.

Q. Which is the vena saphena minor, and how distributed ?

A. The vena saphena minor, vel externa, arises on the outside of the anastomosis of the sciatic with the crural before mentioned, and runs backward between the biceps and neighbouring muscles, and so down the backside of the leg, very near the skin, all the way to the outer angle. In its course downward it sends off a branch about the middle of the backside of the thigh ; and immediately above and below the ham, this vein sends out other branches, which all communicate with the saphena major. About the beginning of the tendon achillis the little saphena runs outward in the integuments, toward the outer angles, where it terminates in cutaneous ramifications sent to every side.

Q. Which is the vena poplitea ?

A. The

A. The crural vein, a little above the ham, takes the name of poplitea, and as it runs down between the two condyles, it gives branches to the flexor muscles of the leg, and is ramified like the artery : afterwards it loses its name, being divided into three considerable branches, called tibialis anterior, tibialis posterior, and peronæa; of which the tibialis posterior is most frequently a continuation of the trunk, and the other two like branches.

Q. How is the tibialis anterior distributed ?

A. The tibialis anterior, having sent some small branches to the muscles behind the heads of the two bones of the leg, perforates the interosseous ligament, and runs between the superior portions of the musculus tibialis anticus, and extensor digitorum pedis, sending off small superficial branches to the head of the tibia and fibula, and to the joint of the knee, which communicate with the lateral branches of the poplitea; afterwards it divides into two or three branches, which, with the anterior tibial artery, surrounds it by small communicating circles. These branches, having reached the lower extremity of the leg, unite in one, which are afterwards ramified in the foot.

Q. How is the vena tibialis posterior, vel furialis, distributed ?

A. The posterior tibial vein sends off a branch from its origin toward the inside, to the gastrocnemii and solæus muscles, named furialis. Afterward the posterior tibialis runs down between the solæus and tibialis posticus, giving branches to each of them. It is divided in the same manner

manner as the tibialis anterior, and accompanies the artery as low as the outer ankle, furnishing the musculus tibialis posticus, and the long flexors of the toes. Lastly, it passes on the inside of the os calcis, under the sole of the foot, where it forms the vena plantares, sending ramifications to the toes nearly in the same manner as the arteriæ plantares.

Q. How is the vena peronæa distributed?

A. The vena peronæa is likewise double, and sometimes triple, and proceeds from the poplitea as before observed: it runs down on the inside of the fibula, in the same manner as the arteria peronæa, which it likewise surrounds, by communicating branches, after the manner of the tibiales. It runs down as low as the outer ankle, sending ramifications to the muscoli peronæa, and long flexors of the toes.

Q. What are the nerves of the leg?

A. The principal nerves are the crural and sciatic. The anterior crural nerve is formed by the union of branches, from the first, second, third, and fourth lumbar nerves, which running along the musculus psoas, escapes with the large blood vessels out of the abdomen, and is distributed to the muscles and teguments on the fore part of the thigh: one branch of this crural nerve accompanies the vena saphena as far as the ankle. The situation of the kidney upon, and the course of the ureter over these nerves, is the reason that in a nephritis the trunk of the body cannot be raised erect without great pain, that the thigh loses its sensibility, and that it is drawn forwards. The remainder of the fourth and the fifth lumbar nerves join with the first,
second

second, and third that proceed from the os sacrum: these five when united, constitute the largest nerve of the body, so well known by the name of sciatic, or ischiatic nerve, which seems to be bigger in proportion than the nerves of any other part. When this nerve is obstructed, we see how unable we are to support ourselves, or to walk.

The sciatic nerve then goes out at the large hollow, behind the great tubercle of the os ischium, and passing over the quadrigemini muscles, runs down the posterior part of the thigh, giving off every where as it goes nerves to the teguments and muscles of the thigh and leg. At the ham it splits into two, the smaller mounting over the fibula, and serving the peronæi, flexores pedis, and extensores digitorum, is continued to the toes; the larger trunk sinks under the gasterocnemii, and then divides; one is spent on the muscles of the back of the leg and teguments, while the other is continued by the inner ancle to the foot, and then subdivides; one branch is distributed after the same manner as the ulnaris, and the other as the radialis in the hand.

Q. What are the glands of the leg?

A. The principal are the inguinal glands, situated in each side in the groin, near the crural vessels, and are in various diseases apt to grow tumid and inflamed. Abscesses are often formed in them; but their use in the body is not easily understood.

About the flexure of the knee and foot, there are also found here and there some small glands;

as also in some places between and among the muscles; but these are here omitted, for the reason I have before mentioned.

DIALOGUE VIII.

Of the PARTS of GENERATION in both Sexes.

Q. **W**HAT are the parts of generation in men?

A. The parts of generation in men, are the testes, vesiculæ seminales, prostatae, and penis; to which may be added the urethra, common to both men and women.

Q. What are the testes?

A. The testes, or testicles, separate the seed from the blood, and are two oval glandular bodies seated in the scrotum, which is the external coat or covering, made up of the epidermis and cutis, and immediately under the latter is a thick cellular texture closely adhering to it. The loose membrane immediately underneath the scrotum is called dartos, which envelopes each testicle singly, and forms a septum or partition between the two: it is also wholly cellular, without muscular fibres, and without fat. Under the dartos is the cremaster muscle, (see page 189) one to each testicle: it is probably owing to the action of this muscle, that the scrotum is gathered up into rugæ by cold; as neither the
scrotum

scrotum nor dartos are furnished with muscular fibres, as before observed. Under this muscle is the first of the proper integuments, or coats, called *processus vaginalis*, *tunica vaginalis*, and *elythroides*; which is formed by the dilatation of the productions of the external membranes of the peritonæum through the abdominal rings: this coat is continued from the peritonæum to the testicle, which it embraces loosely, the whole body of the testicle adhering to one end of the epididymis hereafter mentioned: it encloses the spermatic veins and arteries, termed *vasa preparantia*; and likewise those vessels which convey the semen from the testicles to the *vesiculæ seminales*, called *vasa deferentia*; but it is divided by a septum, or an adhesion immediately above the testicle, so that no liquor can pass out of that part of this membrane (which encloses the spermatic vessels) into that which encloses the testicle. Large quantities of water (which is termed the *hydropsis testis*) are sometimes found in either or both of these cavities, which disease is easily remedied by a puncture with a lancet, but rarely cured without opening the cavity where the water is contained, as in sinous ulcers: the true *hernia aquosa* is from the abdomen, which either extends the peritonæum into the scrotum, or breaks it, and then forms a new membrane, which thickens as it extends, as in the aneurismal and atheromatous tumors. The dropsey in this cyst, for such it properly is, rarely admits of more than a palliative cure, by puncture or tapping, like the dropsey of the abdomen, and this with
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some difficulty, because the omentum usually, and sometimes the gut, descends with it. The other proper and last coat, which immediately encloses the testicles, is called albuginea, from its white colour; it is strong and thick, very smooth and equal: and the branches of the vasa preparantia are finely weaved upon it. The substance, or kernelly part of the testicles, is of a white colour, and of a pretty firm texture, universally allowed to be a continuation of the evanescent branches of the spermatic artery, rolled up together. It is divided into more than twenty portions or clusters separated from one another by as many partitions, which are productions of the albuginea; each cluster between two partitions terminates in one duct, which ducts (above twenty in number) meeting together, form a kind of net-work adhering to the albuginea: from this net-work arise ten or twelve other distinct ducts, which uniting, constitute the head or beginning of the epididymis, and quickly by their conflux form one larger duct; this single duct makes a roundish hard body on the upper and posterior part of the testicle, called epididymis, as it were an additional testicle; and at length terminates in the vas deferens, from whence it is evident the epididymi are the beginning of the vasa deferentia, which are excretory ducts to carry the elaborated seed into the vesiculæ seminales. They pass from the epididymi of the testicles, together with the blood vessels, through the abdominal rings, all enveloped in one common sheath (the tunica vaginalis) called the spermatic

matic cord or rope. When they have entered the abdomen, they separate from the spermatic vessels, and pass directly through the pelvis, close to the bladder, to the vesiculæ feminales. The spermatic veins and arteries are termed *vasa preparantia*, as before observed: the spermatic artery (one on each side) arises from the aorta descendens inferior, as mentioned in the description of that artery: it is the smallest artery in the whole body for the length it runs: the spermatic veins accompany the arteries through the abdominal rings to the testis: and as there is no red blood found in the substance of the testis within the albuginea, most certainly secretion begins immediately upon the entry of the arterial twigs into that substance: these arteries, unlike all others, arise small, and dilate in their progress, that the velocity of the blood may be sufficiently abated for the secretion of so viscid a fluid as the seed. The right testicle returns its vein into the cava, and the left into the emulgent vein on the same side as before mentioned; both because it is the readiest course, and because this spermatic vein may not be obliged to cross the aorta, whose pulse would be subject to stop the blood, which returns from the testicles very slowly, by reason of the narrow orifices of the spermatic arteries, and the largeness of the veins. The testicles have many lymphæducts, which discharge themselves into the inguinal glands. Their nerves come from the intercostal, and twenty-first of the spine. The spermatic arteries carry the blood from the aorta to the

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testicles,

testicles, which separate that part of it which is fit for seed. The veins carry back to the cava what blood remains after the secretion of the seed. The seed is farther purified in the epididymes, and in coition is carried by the vasa deferentia into the urethra.

Q. What are the vesiculæ feminales?

A. The vesiculæ feminales are two membranous bags or receptacles, one on each side, situated at the lower and posterior part of the neck of the bladder, into which the semen is received from the vas deferens, and there deposited and accumulated, till it is thrown out by the urethra in the venereal act. They are each of them one uninterrupted cavity, shut at one end, and sending out a duct at the other, into which duct the vas deferens opens. The external membrane is made up of muscular fibres, which in time of coition contract and press the vesiculæ, ejecting the seed through the prostate glands into the urethra.

The seed passes in time of coition from the vasa deferentia, as well as from these receptacles; for when the ducts into the urethra are distended, that is the direct course from the vasa deferentia, as well as from the vesiculæ feminales.

Q. What are the prostatæ?

A. The prostatæ are two glands in men, or rather one, about the size of a walnut. These glands lie between the vesiculæ feminales and penis, under the ossa pubis, almost within the pelvis, surrounding and closely embracing the beginning of the urethra. They separate a limpid glutinous humour, which is carried into
the

the urethra by several ducts, which enter near those of the prostatæ. This liquor is thrown into the urethra in the act of generation, along with the semen, and is mixed with it, to make it flow more easily. If the venereal infection reaches the prostate glands, it will sometimes make large abscesses, which are apt to form sinuses, and even make a passage into the bladder. It is often cured by opening the sinuses, and consuming the diseased parts by escharotics: but a much better and easier way is to cut out all the fistulous and diseased parts at once.

Q. What is the penis?

A. The shape, situation, and use of the penis are so well known, as to need no description. The substance of the penis is composed of two spongy bodies, called corpora cavernosa, part of the urethra, the glans or nut at its extremity, and its integuments. The two corpora cavernosa, vel spongiosa, (which during erection make the chief bulk of the penis) arise from the os pubis, on each side, and are continued to the root of the glans: they arise distinct, but are soon after united, divided only by a septum its whole length; it is strongly connected to the os pubis by a small ligament, which arises from its back. They take their name from being porous like sponge, and capable of being enlarged by the blood penetrating their substance, which forms a sort of loose net-work internally, upon which the branches of the blood vessels are curiously spread. When the blood is stopped in the great veins of the penis, that which comes by

the arteries runs through several small holes in the side of their capillary branches into the cavities of the net-work, by which means the corpora cavernosa become distended, and the penis erected.

The gland of the penis, though in appearance a part of its body, is in reality a continuation of the spongy substance of the urethra, reflected over its extremity, and expanded in the form we see. It is covered over with a thin epidermis, under which there are numerous nervous papillæ, which render it extremely sensible. The integuments of the penis are first the cuticula and cutis, which being folded back, and adhering round the root of the glans, form the præputium or fore-skin; the small ligament, by which the præputium is tied to the other side of the glans, is called frænum; the use of the præputium is to keep the glans soft and moist, that it may have the more exquisite sense. Under the common integument above mentioned the penis hath a proper coat covering all its body, from the glans exclusive backwards: it is of a tough tendinous texture. On the upper side of the penis are two arteries, and one vein called vena ipsius penis. The arteries are derived from the hypogastrics, and the vein runs also back to the iliac veins. It has two nerves from the os sacrum, and several lymphatics, which empty themselves into the inguinal glands.

Q. What is the urethra?

A. The urethra is a canal which runs along the under-side of the corpora cavernosa, through which

which both the urine and seed pass; it begins at the neck of the bladder, and runs in a furrow between the two corpora spongiosa penis to the extremity of the glans. Its whole length, without the erection of the penis, is about twelve or thirteen inches; its thickness about that of a goose quill. It consists of two thick strong membranes, with a spongy texture between them: its beginning at the neck of the bladder, is surrounded and covered by the prostatae, as hath been said; at its emergence from which gland it becomes thicker and wider for the length of an inch, which thick part is called its bulb, from the resemblance it bears to a bulbous root. Its inner membrane is pierced with many holes here and there, thro' which, from a glandular apparatus in the spongy substance of the urethra, a mucilaginous liquor is furnished, serving to defend it against the acrimony of the urine. Besides these orifices, which some call lacunæ, Cowper, in a particular treatise, hath described and beautifully delineated three glands, two near the bulb of the urethra, one on each side, about the bigness of a pea, and a third, less than the other two, at the bending the urethra, under the os pubis. The first two are often found; but sometimes wanting or very small: the third is but seldom met with by the best anatomists. Where they exist, they probably serve for the same use as the other lacunæ. Women, though their urethra is shorter and wider, are not without the same kind of lacunæ, serving for the same use, and liable to

the same infection I shall presently mention. All these glands have excretory ducts into the urethra, and from them are secreted all the matter which flows from the urethra in a gonorrhæa, whether venereal or not. In the venereal infection, the urethra and the glands are first inflamed by the contagious matter, that causes a heat of urine, which abates as soon as the glands begin to discharge freely; but if by chance this disease continues till any part of the urethra is ulcerated, the ulcer never heals without a cicatrix, which constricts the urethra, and occasions what is vulgarly called a caruncle.

Q. What are the parts of generation proper to women?

A. The parts of generation proper to women are generally divided into external and internal. The external parts of generation in women are the mons veneris, which is that rising of fat covered with hair, above the vulva or rima magna, upon the os pubis; the great doubling of the skin on each side the rima is called labia pudendi, which is only the skin swelled by the fat underneath. These lips being a little separated, there appear the nymphæ, one on each side the rima. In the angle which the nymphæ form in the great chink next the os pubis, is the extremity of the clitoris, strait under which appears the meatus urinarius, or orifice of the urethra. On the opposite side next the anus are the glandulæ myrtiformes, situated in the fossa magna, or interior cavity of the pudendum muliebre; and in this angle of the chink, there is a ligament called the fork, which is torn in the first birth.

Q. What

Q. What are the nymphæ?

A. The nymphæ are two membranous parts, situated interiorly on each side the rima; these two small bodies are red, and somewhat resemble the membranes, or wattles under a cock's throat; they are sometimes smaller, sometimes larger, and are continuous to the præputium of the clitoris. The nymphæ are spongy in their internal substance, and full of blood vessels, and therefore they swell in coition; they receive vessels and nerves as the clitoris. The nymphæ are full of nervous papillæ, whence their quick sense: they have also small glands that secrete a fatty matter. Their use seems to be to increase the pleasure in coition; to direct the course of the urine; and to defend the internal parts from external injuries. They are bigger in married women than in maids. The nymphæ are sometimes so large, as not only to hang without the labia pudendi, but also to prove very troublesome, so as to require extirpation. Though this operation is rarely found necessary in our parts of the world, it is frequently practised in the East; being properly the circumcision of women.

Q. What is the clitoris?

A. The clitoris, (which some call mentula muliebris) is situated in the fore part of the vulva, at the angle which the nymphæ form with each other. It is generally about the bigness of the uvula, and its shape much resembles the shape of that part, yet it is sometimes found as large as the penis: but even in this

case it has no urethra; for though it has a glans like the penis, it is not perforated. The prepuce, covering the glans of the clitoris, is formed of the cutis of the pudendum, and furnished with nervous papillæ: hence it is of exquisite sensibility to the touch. The clitoris, in its common natural state, lies entirely buried under the skin or prepuce; no part of it appearing but its extremity covered with the præputium. The substance of the clitoris is composed of two spongy bodies, such as those of the penis; they arise distinctly from the lower part of the os pubis, and soon after unite and form the body of the clitoris and its glans, which is of exquisite sense, as already mentioned. Before these spongy bodies unite, they are called crura, as those of the penis: the two muscles which are said to erect the clitoris in coition, in the same manner as the muscles of the penis erect that part. are already spoken of. The glans of the clitoris is usually covered with a foetid matter, like that of the glans of the penis. It is also connected to the os pubis, by a ligament, in the same manner as the penis is in men. The clitoris receives veins and arteries from the hæmorrhoidal vessels and the pudenda; and nerves from the intercostals, which are likewise distributed through all the parts of the vulva. The use of the clitoris is to produce a titillation in coition, and it is said to be the chief seat of pleasure to women in that act, as the glans is in men.

Q. What are the internal parts of generation in women?

A. The

A. The internal parts of generation in women are the vagina, uterus or womb, ovaries, and Fallopian tubes. A little lower than the clitoris, between it and the vagina, or rather just within the vagina, is the orifice of the urethra, termed *meatus urinarius*. The urethra in women is the same as in men, only shorter, wider, and more strait; it is naturally as big as a goose-quill.

Q. What is the vagina?

A. The vagina, or neck of the womb, is a large canal which reaches from the external orifice, or *os pudendi*, to the internal mouth of the uterus. It is usually about five or six fingers breadth long in maids, and one and a half broad; but it varies in different subjects, and in married women who have borne children; its length and bigness cannot be determined, because it lengthens in the time a woman is with child, and it dilates in the time of birth. The texture of the vagina is membranous, being composed of two membranes, of which the inner, which lines its cavity, is nervous, and full of wrinkles and *fulci*, especially in its fore part. It has three or four small glands on that side next the rectum, which pour into it a viscid humour in time of copulation. The *rugæ* or wrinkles of this membrane, are for the friction of the *balanus* or *glans penis*, to increase the pleasure in coition, both to the man and woman; and to render the part capable of the necessary dilatation in parturition. These *rugæ* are largest in maids; in married women they are much fainter, and seem as if worn down; and

and in women who have borne children, they are almost entirely obliterated. The external membrane of the vagina is made of muscular fibres, which, as occasion requires, dilate and contract, become long or short, for adjusting its cavity to the length and bigness of the penis. The lower part, or orifice of the vagina, is contracted with a sphincter that it may grasp the penis closely: (See muscul. sphincter, vaginæ) and to the abundance of nervous papillæ in the inner membrane, is owing its quick sensation. The oscular orifices of the excretory ducts of the glands, situated under the rugæ of the vagina before mentioned, are called lacunæ: these glands are the seat of a gonorrhœa in women, as the glands in the urethra are in the male. The vagina receives veins and arteries from the hypogastric and hæmorrhoidal vessels. It has nerves from the os sacrum.

Near the beginning of the vagina, immediately behind the orifice of the meatus urinaris, is situated a valve, called Hymen, (from the god of marriage, in the heathen mythology) which commonly passes among us for a test of virginity. The following is Mr. Cheselden's description of it: the hymen is a valve constantly found in the vagina of children, which, looking towards the orifice of the vagina, closes it, but as children grow up, and the sphincter vaginæ grows strong enough to contract and close the orifice of the vagina, this valve becoming useless ceases to encrease, and is there known by the name of glandulæ or carunculæ myrtiformes. There have been a
few

few instances in which the edges of this growing together, it continued unperforate, until it has been necessary to make an incision to let out the menses. Betwixt the vagina and urethra in women, there is a compact cellular substance, which Bartholine says is glandular, but it does not appear to be so: he also calls it the female prostate. Some have named it Bartholine's prostate gland, from his first noticing it as being glandular. When by an abscess in this part sometimes occasion a dribbling of urine which passes from the urethra thro' the vagina.

Q. What is the uterus?

A. The uterus or womb, is seated at the end of the vagina, and lies also between the bladder and rectum. The os pubis is a fence to it before, the os sacrum behind, and the ilium on each side, these forming as it were a basin for it, termed the pelvis; but because it must swell whilst women are with child, there is a greater space between these bones than in men; and for this reason it is, that women are bigger in the haunches than men. It should be noted that, in infancy the pelvis is smaller in proportion than in adults; whence the viscera which are wholly in the pelvis of adults, are seated higher in infants. In infancy the womb is placed above the pubis, but gradually descends as the pelvis enlarges, so that in adult women who are not pregnant, nor otherwise disorderd, the womb is entirely sunk into the pelvis. The figure of the uterus is like a pear, from its internal orifice to its bottom; in women not with child, the length of the uterus
is

is about three inches; its breadth in the upper part two, and in the lower part one inch; its thickness is about an inch and a half; in maids, indeed, the uterus is much smaller than this, (the cavity being about the size of a small almond :) but in women with child it is larger, according to the time of gestation. It presses the bowels, and reaches to the navel towards the time of delivery; whilst at other times it does not rise above the os sacrum. The upper and broader part of the uterus is called the fundus; and the lower part, into which the vagina opens, is termed the cervix: its orifice into the vagina is called os uteri, and by some os tinæ, from the resemblance it bears to a tench's mouth; it may be also compared to the mouth of a young puppy dog, and the glans penis. This internal mouth of the womb is very small in virgins, but in women who have had children, or who are with child, it is larger; and in the last it is always closed up with a glutinous humour. In the time of delivery, it in a wonderful manner expands itself, so as to give passage to the child. The substance of the womb is vascular, being composed of a various plexus of fleshy fibres, with a great number of vessels between: in women not with child it is compact and firm; in those with child it is spongy and sinuous, and is capable of wonderful dilatation, without any diminution of its thickness. Its bottom, or fundus, grows thick as it dilates, so that in the last months of gestation it is at least an inch thick, where the placenta adheres, because its roots run into the substance

substance of the womb. The uterus is covered externally with a membrane from the peritonæum, and internally its cavity is lined with a porous and nervous membrane; but in women with child, this inner membrane almost entirely disappears. The blood vessels of the uterus are tortuous, and make a vast number of anastomoses with one another: they open by a number of little mouths into the uterus and vagina, and are the sources of the menstrual discharge. The arteries and veins of the uterus are branches of the hypogastric and spermatic vessels, whose large ramifications inosculate with each other, as also the branches on one side of the womb with those of the other. The veins are greatly larger than the arteries, especially in women with child.

About the age of puberty, when the blood which used to be spent in the increase of the body, being accumulated, distends the vessels, it breaks forth once a month at those of the uterus; because of all the veins of the body, which stand perpendicular to the horizon, these only are without valves. This evacuation is called *menstrua*, *menfes*, and *catamenia*; and vulgarly *flowers*, *courses*, &c.

The nerves of the womb come from the intercostals, and from those which come from the os sacrum. There are also several lymphatics upon its outside, which unite by little and little into greater branches, and discharge themselves into the reservoir of the chyle. The uterus is tied by two round ligaments; and by what is called the *ligamenta lata*, being like two
broad

broad ligaments, though it is only a production or continuation of the peritonæum, from the sides of the womb: the ovaria are fastened to one edge of the ligamenta lata, and the tubæ Fallopianæ run along the other; these productions, or continuations of the peritonæum, are commonly compared to the wings of a bat, and are therefore called vesperilionis alæ. The two round ligaments, or ligamenta rotunda, arise from the sides of the uterus, and pass through the oblique and transverse muscles of the abdomen to the groin, in the same manner as the seminal vessels do in men. This way the gut passes in a hernia intestinalis in women. (See muscles of the abdomen.) These ligaments are partly continued or joined to the musculus fascia lata, on the upper part of the inside of the thigh; and from thence comes the pain that women big with child feel in this place. The substance of these ligaments is hard, but covered with a great number of blood-vessels; they are pretty big at the bottom of the womb, but they grow smaller and flatter as they approach the os pubis.

Q. What are the ovaria;

A. The ovaria, termed by the ancients testes muliebres, are two bodies of a depressed oval figure, situated one on each side the fundus uteri; they are commonly about half the size of men's testicles, but differ according to the age and temperament of the subject. They are white, smooth, and largest in persons in the vigour of their age, and in women who are most mature; in such subjects they are found of

two drachms weight, and furnished with a number of prominent vesicles. In old people they scarce weigh half a drachm, and are dry, corrugated, and deformed with cicatrices. The ovaria are surrounded by a strong white membrane from the peritonæum, and are of membranous substance, fibrous, reticulated, and full of vessels variously interwoven; they contain from ten to twenty, or more, pellucid eggs, which are supposed to contain the first rudiments of the foetus; the largest of them is not so big as a pea. There are two arteries, and two veins, which pass to and from the ovaries, or testes, in the same manner that they do to and from the testicles in men; but make more windings, and the arteries dilate more suddenly, in proportion as they are shorter. These arteries and veins detach branches into the uterus and Fallopian tubes, and not only make communications betwixt the artery and vein on one side, and those of the other, but also with the proper vessels of the uterus, which are detached from the internal iliac arteries and veins. Besides the spermatic vessels, the ovaria have nerves from the intercostals and lymphatics, which discharge themselves into the common receptacle. The ovaria are connected to the fundus uteri, by means of the ligamenta rotunda; to the Fallopian tubes, and the sides of the pelvis, by the ligamenta lata, or vesperitionis alæ; and to many other parts by means of the spermatic vessels.

Q. What are the tubæ Fallopiæ?

A. The Fallopian tubes are two canals of a tortuous

tortuous figure, but approaching to a conic form, are joined to the fundus uteri one on each side; one end of the tube is connected to the uterus, and opens into its cavity; its orifice is small, being about the size of a large hog's bristle. The other end is much larger, and is fimbriated, or fringed round the edges, therefore called *morfus diaboli*; it is free, and fluctuates about the abdomen, and when there is occasion, this extremity applies itself to the ovary, embracing it with these muscular segments or fringes. Though the extremities of these tubes are small, the middle, or widest part is about the size of one's little finger. Their length is about six, seven, or eight fingers breadth, different in different subjects; they are connected to the ovaria by the *alæ vespertilionis*. Their substance is membranous and cavernous: they are composed of a double membrane; the exterior one seems to be continuous with the peritonæum, and the interior, with the interior membrane of the uterus. They are wrinkled on the inner surface, and are imbued with a lubricous humour; but they are not cellular in the human body, as in other animals. They are furnished with a great number of vessels, having the same veins, arteries, nerves, and lymphatics, as the ovaria: and have a cavernous substance between their membranes, by means of which they are rendered rigid in applying their mouths to the ovaria; they are also moistened on their inner surface by these vessels. Their use in generation is very great; they become erect in the time of coition,

coition, from the influx of the blood and spirits; and at that time, by a natural motion, they apply their loose fringed extremity, to the ovaries, which are surrounded and embraced by them. In this state they convey to them the prolific matter of the male semen injected into the womb; and after one of the ovula is impregnated, they receive and convey it to the womb. The Fallopian tubes unperforated, upon the foregoing hypothesis, must cause barrenness, and seed lodged in these tubes may have the same effect; which probably is often the case of common whores, and women that use coition too frequently; and perhaps the fat in the membrane, that connects the ovaria to the tubes, may, in very fat women, so keep these tubes from the ovaria as to interrupt impregnation; besides these cases, too much or too little of the menses may destroy or interrupt conception; but the latter case, especially in young women, is very rare. From such causes as these, and not from imbecility, it is most probable that barrenness oftener proceeds from women than men; and though women do not propagate to so great an age as men, it seems not to be owing to an incapacity of being impregnated, but from their menses ceasing, and those vessels being closed, which should nourish the foetus after the impregnation, as if on purpose to prevent the propagation of a feeble and infirm species. From this consideration, it is reasonable to suppose, that the perfection of the foetus, notwithstanding it is first formed in the male seed, depends more upon the female

than the male, or else that nature would, for the sake of the species, have been careful to hinder men as well as women from propagating in a declining age.

The seed of all animals, and particularly of mankind, is a whitish fluid secreted from the blood in the testes as above; in which *Lewenhoeck*, by the help of microscopes, discovered an infinite number of animals like tadpoles, which he and others suppose to be men in miniature, and that one of these being entered into an egg in one of the ovaria, conception is performed.

DIALOGUE IX.

Of the EMBRYO, and the FOETUS in UTERO.

Q. **W**HAT is the embryo?

A. The embryo, is a name given to what a woman has conceived with, from the time of conception; till the parts are perfectly formed. From conception, until the egg hath been some five or six days in the uterus, it is almost impossible to describe the changes it undergoes, upon the account of its minuteness, and for want of observations? after that time we may speak of the matter with more certainty. The egg is then a round pellucid globule, of only one membrane containing

taining the embryo, which hath a very large head, a small body, and no legs or arms, swimming in a large quantity of a pellucid liquor; it hath then a large flat umbilicus, by which it adheres to the obtuse extremity of the egg. The proper membrane of the egg, called amnion, by degrees sends off all around its surface small flocculent vessels, whereby it grows to those vessels of the uterus from whence the menses were wont to flow before pregnancy: by degrees these flocculent vessels round the greatest and inferior part of the egg, cease to grow, degenerating into a second membrane, called chorion; while those vessels at the upper and blunt end, keep increasing in their diameters, and at length form the placenta to be described hereafter. In the first two months, or at the end of that time, there appears not any thing bony, the several parts or members not being distinctly formed till the third month. The head is first perfected; the thorax or breast next; then the abdomen; and last of all the extremities.

Q. When does the embryo take the name of foetus in utero?

A. When all the parts are distinctly formed. The foetus is involved in the same coats as the embryo, viz. the chorion externally, and the amnion internally, which immediately inclosed the foetus. They contain a quantity of liquor, which is a proper medium for so tender a being as the foetus to rest in, and partly secures it from external injuries, as the aqueous humor does the crystalline in the eye;

and when the membranes burst in the time of birth, this humour lubricates the vagina, to render the birth less difficult. Besides the amnion and chorion above, there is the false or spongy chorion, which Dr. Hunter has found to consist of two distinct layers: that which lines the uterus he styles *membrana caduca* or *decidua*, because it is cast off after delivery; the portion which covers the ovum, he calls the *decidua reflexa*, because it is reflected from the uterus upon the ovum, forming the connecting medium between them. The portion which covers the ovum is a complete membrane, like the true chorion and amnios: but that which immediately lines the uterus is imperfect or deficient, being perforated with three foramina, viz. two small ones, corresponding with the insertion of the tubes at the fundus uteri; and a larger ragged perforation opposite to the *orificium uteri*. The true chorion and the amnios are organized membranes, containing vessels, and composed of regular layers of fibres. The *decidua* and *decidua reflexa*, differ in appearance from the true chorion, and seem to resemble those inorganic substances which connect inflamed viscera. If they be original membranes, and only visible from their evolution and increase, it is not easy to conceive how the ovum gets behind them, since the Fallopian tubes are not covered by them. It therefore seems most probable that, an opinion first suggested by Mr Cruikshank is the truth, and which is rendered probable by the experiments

experiments of Signor Scarpa, "That they are entirely composed of an inspissated coagulable lymph."

Q. How is the foetus in utero nourished?

A. This is a matter of much controversy, but the most reasonable opinion is, that the foetus is nourished not by the mouth, but by the umbilical vessels.

Q. What is the placenta?

A. The placenta is a soft, roundish mass, found in the uterus of pregnant women, which from its resemblance to a cake derives its name; and being also like the liver, was called by the ancients *hepar uterinum*, or womb-liver. The number of placentæ in human subjects, answers to that of the foetuses; and as these are usually single, the placenta is usually so too: but when there are two or more foetuses, there are always as many placentæ; yet in this case they often cohere together, so as to seem but one; but their vessels rarely communicate from one to the other. The placenta is usually about six inches in diameter, and one inch thick in the middle, growing a little thinner towards the circumference; it is surrounded with a smooth membrane from the chorion and amnion, and its concave part is turned towards the foetus; it has no particular part of the uterus to adhere to, but is usually fixed to the fundus uteri. Doctor Thomas Simson, of St. Andrew's, however, thinks that it has no place in the ovarium, nor in the uterus till once the ovum becomes contiguous to the fundus; and then every con-

tiguous part becomes really a placenta. The placenta is composed of the extreme branches of the umbilical vein and arteries, which are for the composition of this part divided into an infinite number of exceeding small branches, to join a like number of the menstrual vessels of the uterus, which vessels of the uterus are made numerous rather than large, that the separation of the placenta from them may not be attended with a flux of blood fatal to the mother; for the sides of little vessels soon collapse and close, and they are more easily stopped, being compressed by the uterus itself as it shrinks, which it begins to do from the time of the birth; but when the placenta is separated before the delivery, whether untimely or not, these vessels bleed until the uterus is discharged of the foetus. The arteries and veins of the uterus, by which the menstrual purgations are made, are joined to the umbilical arteries and veins in the placenta, the arteries of the uterus to the veins in the placenta, and the veins in the uterus to the arteries of the placenta: by these vessels a large quantity of blood is continually flowing from the mother to the foetus and back again.

Q. What is the navel-string?

A. The navel-string, or umbilical blood-vessels, termed funiculus umbilicalis, passes out at the navel of the foetus to the placenta. It is commonly about two feet long, that the foetus may have room to move without tearing the placenta from the uterus, which being done too soon, from whatever cause, occasions a miscarriage.

miscarriage. This umbilical cord is composed of a spongy substance enclosing the blood-vessels, viz. two arteries and one vein, twisting about each other, particularly the arteries about the vein. The arteries arise from the internal iliacs of the child, and running up on each side of the bladder, perforate the belly where the umbilical vein entered. With the arteries and vein above-mentiond, there also passes a vessel called urachus, which arises from the top of the bladder. The umbilical vessels, with the urachus, being shrunk up after the birth, lose much of their appearance, especially near the navel, where they are sometimes not to be distinguished. The umbilical vein goes from the navel directly to the liver, and there enters the great trunk of the vena portæ; it has its origin from small venous tubuli, arising from the chorion, where the evanescent twigs of the arteries are lost; and at length forming one large trunk, enters the umbilicus of the embryo, goes to the liver as before observed, and opens into the sinus of the vena portarum. Near this entrance there goes out the ductus venosus to the great trunk of the cava, which carries part of the blood that is brought by the umbilical vein that way into the cava, while the rest circulates with the blood in the porta; the whole of it not passing through the ductus venosus, as is generally believed, but a great part of it into branches of the porta, in the liver; otherwise there need be no communication between the umbilical vein and the porta. After the birth, when the umbilical

vein is stopped, it becomes a ligament, and the ductus venosus soon shrinks and almost disappears, having no longer any blood flowing through it. The blood which flows from the mother to the foetus by the umbilical vein is returned, all but a small quantity, which is reserved for nutrition by the two umbilical arteries.

Q. How does the blood circulate from the mother to the foetus, and from the foetus to the mother?

A. The manner in which the blood flows from the mother to the foetus, and from the foetus to the mother, is as follows, viz. the uterine arteries in the mother bring arterial blood to the organ of the placenta in the egg; which being taken up by the beginning of the veins of the placenta, is transmitted to the foetus, through the umbilical vein, into the vena portarum; and from thence into the cava and heart, and the two umbilical arteries in the foetus being continued from the aorta, carry their blood to the placenta; which blood, at the adhesion of the placenta to the uterus, is taken up by the beginning of the uterine veins, and transmitted to the cava and heart of the mother; what was arterial in the one becoming venous in the other interchangeably; but the foetus hath some peculiarities in its own proper circulation besides. Or as Professor Hamilton says in his first lines. The communication between the parent and child is carried on entirely by means of the placenta, whose spongy surface adheres to the internal surface of

of the womb, and receives the finer parts of the arterial blood of the mother by absorption. No anastomoses of blood-vessels between them have yet been clearly shewn by the experiments of any physiologist; nor has any coloured injection been pushed from the uterus into the anterior vascular part of the cake, nor from the fœtus or umbilical vessels into the cellular part, except by the force of extravasation. This cellular part of the placenta is probably derived from the decidua; and is not a spongy inorganic substance, merely intended for the attachment of the cake, but probably a regularly constructed and organized part belonging to the mother. The cells, therefore, cannot be filled by injection from the umbilical vessels, though an injection will readily pass from the vessels of the uterus. As the structure of the cellular part of the placenta is somewhat similar to that of the more simple glands, it may be reasonably inferred, that it is intended for other purposes besides merely absorbing blood, and conveying it to the umbilical vessels of the child. It seems probable, therefore, that an operation similar to secretion is carried on in the placenta, that the veins and arteries of the fœtus, in the vascular part of the cake, are continuous; and that absorbents arise in the follicles, which soon terminate in veins. From this view it appears, that the placenta is not only the connecting medium between the mother and the child, intended for conveying and returning the nutritious fluid from the

one to the other, but also changes and prepares it, in a particular manner, for circulating through the minute vessels of the delicate foetus.

Q. What is the magnitude and weight of the embryo and foetus in utero?

A. When the ovum descends into the uterus, it is supposed to be about the size of a poppy seed, and in the third month augmented to the bigness of a goose egg. Ten days after conception, the child (according to some authors) weighs half a grain; at thirty days is increased to the weight of twenty-two grains; at three months, weighs betwixt two and three ounces? and at nine months, from ten to twelve, and sometimes sixteen pounds: by which calculation it would appear, that the progress of the foetus is quickest in the beginning of the growth: for, from its tenth to the thirtieth day (according to this supposition) it encreases to three and forty times its weight. But all these calculations are uncertain.

Q. How is the uterus distended?

A. As the foetus, &c. grow in bulk, the uterus is distended, but retains the same, or nearly the same absolute thickness; the blood-vessels, which in its natural contracted state lay folded and rolled together like threads in a clue, being straitened out now receive blood more freely than before, and become of greater diameters. So that what the uterus loses of thickness by distension, in its membranous or cellular parts, it gains by the enlargement of its vessels. As
it

it is gradually more and more distended, its fundus rises more and more out of the pelvis up into the abdomen towards the colon and stomach, and being stretched to every dimension, creates the bulk we see in pregnancy.

Q. What is the natural situation of the foetus in utero?

A. The natural situation of the foetus in utero for the last months of gestation (for before that time it is uncertain and various) is, as it were sitting with its head and neck bent downwards and forwards; its knees drawing up to its cheeks; its heels lying back toward its hips; and its hands hanging down, and as embracing its knees. But there is a great variety of postures of the foetus, both before and at the time of delivery, as is shewn in midwifery.

Q. What are the differences between a foetus in utero and an adult?

A. The more essential differences between the human foetus ripe for birth, and an adult appear to be as follows. In the abdomen, the umbilical vein and arteries of the navel, and the canalis venosus in the liver, are in the foetus open and pervious; in adults they are contracted and solid. The liver is very large, the stomach is filled with a glutinous fluid, and the larger intestines, and often the ilium also, with the faeces called meconium. The renes succenturiati are larger in the foetus than in adults. The kidneys themselves are not smooth and even on the surface, as in adults,
but

but unequal, and in some measure resemble those of a calf. The urinary bladder is of a longer shape, and extends almost to the navel. The hymen in a female foetus is very plain and obvious. In the thorax besides a peculiar fluid, found as well in this cavity as in the abdomen, the gland thymus is larger than it is in adults. The lungs, as they have never yet been inflated by breathing, are collapsed, and of a blackish colour; and if thrown into water they sink in it contrary to what is the case in adults, or those that have breathed. In the heart, the foramen ovale between the left and right auricle, and the canalis arteriosus, between the pulmonary artery and the aorta, are open, to serve for a peculiar circulation in the foetus, which has not yet breathed; and there is in the inferior trunk of the vena cava, near the heart, a remarkable valve, called by Cheselden, *valvula nobilis*. In the head, besides its great size in proportion to the body, we are to observe, that the ossa cranii are in several places distant from one another, especially at the fontanella; and that the futures are wanting. The brain also is softer than in adults. The teeth are imperfect, and not rooted in the gums; they lie hid or buried under the gums, to appear at a more advanced period. The meatus auditorius is not yet perfect in the foetus, and is entirely closed up by a peculiar membrane, which is continuous with the epidermis, and naturally disappears after delivery. The bones of the whole body, ex-
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cepting a very few, are either soft or absolutely imperfect: some of them are merely cartilaginous, and the articulations are not at that time perfected.

D I A L O G U E X.

Of the EYE.

Q. **W**HAT are the parts of the eye not yet described?

A. The bony socket, muscles, cartilages and ligaments of the external parts of the eye are already spoken of in Dialogue the first. The internal parts not yet mentioned are the glandulæ sebaceæ, caruncula lachrymalis, glandulæ lachrymalis, puncta lachrymalia, orbit, the coats or tunics, viz. tunica albuginea, adnata or conjunctiva; tunica sclerotica; tunica cornea; tunica choroides; tunica uvea, (which contains the iris and pupilla) to which may be added the retina. The humours of the eye, viz. the aqueous, vitreous, and crystalline, to which may be added the extreme thin and fine vascular membrane called tunica arachnoides, and the vessels and nerves of the eye.

Q. What are the glandulæ sebaceæ?

A. The glandulæ sebaceæ are situated in the interior surface of the eye-lids: they serve for the

the secretion of an oleaginous fluid, which is of great use in preventing the attrition of the eye-lids, from their continual motion.

Q. What is the *caruncula lachrymalis*?

A. The *caruncula lachrymalis* is a little eminence situated in the larger angle or canthus major of the eye, serving to direct the tears to the *puncta lachrymalia*, and, according to some anatomists, they help to keep them open when the eyes are shut.

Q. What is the *glandula lachrymalis*?

A. The *glandula lachrymalis* is seated in the upper and outer part of the orbits, with its excretory ducts under the upper eye-lid. This gland separates the matter of the tears, which, by the continual motion of this lid, furnishes at all times water enough to wash off dirt, and to keep the external surface of the eye moist, without which the cornea would dry and wrinkle by the continual action of the external air. As the tears fall off the cornea, they are stopped by the edge of the under eye-lid, along which they run till they fall into the *puncta lachrymalia*.

Q. What are the *puncta lachrymalia*?

A. The *puncta lachrymalia* are two small holes in the inner corner or great canthus of the eye, one in each eye-lid; they are situated at the extremities of the *tarfi* or cartilages, and lead to a small membranous bag or lachrymal sac, which is seated in this corner upon the *os lachrymale*; from the bottom of which there goes a small pipe or nasal canal, which pierces this bone in the nose opening under the upper lamina

lamina of the os spongiosum. It moistens the inner membrane of the nostrils, by the superfluous humour of the lachrymal gland. Sometimes the acrimony of this humour causes sneezing, which we may hinder by pressing the angle of the eye, and so stop its running. Between these two puncta there is a caruncle (as above-mentioned) that serves to keep the holes open when the eyes are shut.

Q. What is the orbit of the eye?

A. The orbit of the eye is that cavity in which the eye is contained, and is in all the vacant places filled with loose fat, which is a proper medium for the eye to rest in, and serves as a socket for its motion. The proper parts of the eye, which form its globe, eyeball, or bulb, are its coats or tunics, the humours, and the vessels.

Q. What is the tunica albuginea?

A. The tunica albuginea, adnata, or conjunctiva is the first membrane or coat of the eyeball; it is a smooth membrane which covers so much of the eye, as is called the white, and being reflected all round, lines the two eye-lids. Being thus returned from the eye to the inside of the eye-lids, it effectually hinders any extraneous bodies from getting behind the eye into the orbit, and smooths the parts it covers, which makes the friction less between the eye and the eye-lids. It is full of small veins and arteries, which appear big in an ophthalmia or inflammation of the eyes. N. B. The conjunctiva is improperly named albuginea or adnata. The conjunctives is a coat common to
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the fore-part of the eye, and the inside of both eye-lids; its very white appearance is, owing to the tendinous expansions of the muscles of the eye which are immediately under it, and have obtained the name of albuginea or adnata, though not properly a coat. The conjunctiva covers the cornea on its external or convex surface.

Q. What is the tunica sclerotica?

A. The tunica sclerotica is a thick, hard and smooth coat, extended from the cornea to the optic nerve; it is opaque behind, but transparent before, where it makes the third coat called cornea. Both together make one firm case of a proper form for the use of the other coats and humours.

Q. What is the cornea?

A. The cornea, so called from its substance resembling the horn of a lanthorn, is convex, transparent, and composed of various laminæ, which are nourished by many blood-vessels, so fine as not even to hinder the smallest rays of light from entering the eye. The cornea is situated in the fore-part of the eye, surrounded by the sclerotica and albuginea; it has a most exquisite sense, to the end that the tears, upon the least pain, may be squeezed out of the lachrymal gland, to wash off any filth, which, by sticking to the cornea, might render it opaque or dim. N. B. The sclerotica and cornea, called by some cornea opaca, and cornea lucida, are in reality, one and the same coat; though very differently circumstanced as to size, situation, texture, and use.

Q. What

Q. What is the tunica choroides?

A. The tunica choroides is the fourth coat of the eye, and is so named, on account of the multitude of blood-vessels resembling the chorion; it lies immediately under the sclerotica, and is much thinner than it, being a membrane of little firmness. It is blackish, or of a dusky brown colour, more or less inclining to red. This membrane, or coat, has a great number of blood-vessels which come from the sclerotica. It is open, or has a hole before, for the passage of the rays of light, called pupilla, this in a foetus is covered with a membrane called pupillaris, which generally disappears about the seventh month; the part of this coat, which makes the circumference of the hole, and lies upon the side of the crystalline humour, is the uvea.

Q. What is the uvea, you mention?

A. The uvea is the fifth coat, and is only a white circle round the back side of the choroides near the cornea, as has been said. In this coat we observe, first the iris, which is a circular variously coloured part, being the anterior surface of the uvea, which surrounds the pupil; it is called the iris, because in different persons it is of different colours; hence the denomination of grey, blue, brown, häsel, black eyes, &c. The iris is entirely vascular, from which arises the variety of colours in the human eyes. Secondly, the pupil, or foramen, which is round in the human eye, nearly in the middle of the iris, and is capable of dilatation and contraction. Through this aperture, the

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rays

rays of light pass to the crystalline, in order to be painted on the retina, and cause vision. Thirdly, its posterior surface, which is black, and in which, when this blackness is cleared away, there appears the sphincter of the pupil, formed of circular fibres for contraction, the ciliary fibres or processes, for the dilatation of the pupil; the ciliary ligament for the motion of the vitreous and crystalline humours; the arterial and venal circles, from the vessels, are in a wonderful manner distributed over the uvea; the choroides; the ligamentum ciliare; and the vitreous and crystalline humours; the ductus nigri, so called from their black colour, placed between the processes and the ligamentum ciliare; the space between the uvea and the cornea, called the anterior camera of the eye; and that between the uvea and crystalline, called its posterior camera, which is either much smaller, or entirely wanting.

Q. What is the retina?

A. The retina is a membrane which may be called the sixth tunic or coat; it lies immediately under the tunica choroides, and is a very delicate, tender, and as it were, mucous coat of the eye, or more properly, it is only an expansion of the optic nerve at the bottom of the eye. It is the great organ of vision, and called retina because it somewhat resembles a net: rays of light striking upon this membrane, the sensation is conveyed by the optic nerves to the common sensorium, the brain.

It is commonly said, that the retina is a **production** or expansion of the medullary substance

stance of the optic nerve; the sclerotica, of the duramater; and the choroides of the piamater, which accompanies this nerve. But this opinion is not altogether agreeable to what we observe in examining the optic nerve, and its insertion in the globe of the eye. If we take a very sharp instrument, and divide this nerve through its whole length, between where it enters the orbit and where it enters the globe, into two equal lateral parts, and then continue this section through the middle or centre of its insertion, the following phenomena will appear, viz. That the nerve contracts a little at its insertion into the globe; that its outer covering is a true continuation of the duramater; that this vagina is very different from the sclerotica both in thickness and texture, the sclerotica being thicker than the vagina, and of another structure; that the vagina from the piamater forms, thro' the whole medullary substance of the nerve, several very fine cellular septa; and that where it enters the globe of the eye, the piamater does not directly answer to the choroides. Lastly, that as the medullary substance of the nerve enters the globe, it is very much contracted, and seems to terminate only in the small tubercle or button already mentioned; but if we examine accurately, we shall find that the retina is really a continuation of the fibres which compose the medullary part of the nerve.

Q. What is the aqueous humour of the eye?

A. The aqueous humour lies in the fore-part

part of the globe, immediately under the cornea: this humour is thin and liquid, of a spirituous nature, for it will not freeze in the greatest frost. This evinces the necessity of a continual supply of this humour; which is manifest it hath, because if the cornea be pricked, and this humour squeezed out, it will be again restored in ten or twelve hours: this aqueous humour lying foremost, seems chiefly of use to prevent the crystalline from being easily bruised by rubbing, or a blow; and perhaps it serves for the crystalline humour to move forward in, while we view near objects, and backward for remoter objects.

As age advances it sometimes happens, that the sight is faulty from a diminution of this humour.

Q. What is the crystalline humour?

A. The crystalline humour is the second, and distinctly contained in a very fine coat or membrane called aranea or arachnoides, and is suspended by means of the ciliary ligament, between the aqueous and vitreous humour, immediately behind the pupil; in this place it hangs free, and is moveable by means of the ligament just mentioned. It is composed of a multitude of lamellæ, like the coats of an onion; and therefore also pellucid and vascular. There is also a small quantity of the aqueous humour contained within or under its coat; which in old age acquires a yellow colour, and consequently occasions a dimness of sight. The crystalline being a thick, compact humour, in form of a flattish convex lens, situated in the middle of the eye, serves to make that

that refraction of the rays of light, necessary to make them meet in the retina, and form an image thereon, whereby vision may be performed. The internal structure of this mass hath not been hitherto sufficiently discovered in the human subject. Its colour and consistence varies in different ages. Until the age of thirty, it is very transparent, and almost without colour: It afterwards becomes yellowish, and that yellowness gradually increases. The consistence varies almost in the same manner, being of an uniform softness till the age of twenty, and afterwards growing gradually more solid in the middle of the mass; but in this there are varieties. The crystalline capsula or coat, is formed by a duplicature of the tunica vitrea, whose external lamina covers the anterior side of the crystalline mass, the internal lamina covers the backside, and likewise the fossula vitrea, in which the crystalline is lodged. The anterior portion of the crystalline capsula is thicker than the posterior, and, in a manner, elastic; and both its thickness and elasticity may be discovered in dissection, without any other artifice.

Q. What is the vitreous humour?

A. The vitreous or glassy humour is the third humour of the eye, so called from its resemblance to glass in fusion, being like a fine clear jelly in appearance; it is thicker than the aqueous, but thinner than the crystalline; and is in greater abundance than the other two. It lies behind the crystalline, and fills up the greatest part of the eye rather more

than three fourths of it: its fore-side is concave for the crystalline humour to lodge in, and its back side being convex, the tunica retina is spread over it; it serves as a medium to keep the crystalline humour and the retina at a due distance.

Q. What are the blood-vessels and nerves of the eye?

A. The eye is furnished in a most wonderful manner with nerves and blood-vessels in all its parts. The blood vessels of the eye are branches of the carotids and jugulars (which see) distributed to all parts of the eye in an amazing manner. The extreme minute ones convey only a fine and subtile lymph thither, by which means the tunics and humours of the eye are nourished; the veins partly carry the blood back to the sinuses of the dura mater, and partly to the jugulars. The nerves of the eye are very numerous; besides, the optic nerves (described in page 68,) pierce the globe of the eye from the side of the nose, a little on the inside of the optic axis or center; their external coat, which is a production of the dura mater, is continued to the sclerotis, as their internal is from the pia mater to the choroides: and the medullary fibres passing through all, are expanded on the retina, upon which the images of objects are painted. The centre of this expansion is insensible, and all rays which fall upon it are lost; consequently, that point of the object from which the rays come, is invisible to the eye; the reason of this proceeds, probably, from the blood-vessels,

sels, which enter the globe of the eye with the optic nerve, and cover this part of the retina. But whatsoever the cause be, there is a manifest advantage in the optic nerves being inserted on the inside of the optic-axis. For if they had pierced the eye in the axis, the middle point of every object had been invisible, and where all things conduce to make us see best, there we had not seen at all.

DIALOGUE XI.

Of the E A R.

Q. **W**HAT are the parts of the ear not yet described?

A. The bones, muscles and cartilages of the ear are already spoken of in Dialogue the second. Its inner substance is cartilaginous, as hath been said, which preserves its form, without being liable to break: its use is to collect sounds, and direct them into the meatus auditorius, which is the passage that leads to the drum. Hence those who have lost their ears, hear not so acutely as others, and endeavour to supply that want by applying the palm of their hand made hollow to their ears: hence the usefulness of hearing trumpets. The internal parts of the ear not yet described are as follows, viz. meatus auditorius, cerumen,

membrana tympani, tympanum, tuba eustachiana, foramina vestibulum and labyrinth, and vessels of the ear.

Q. What is the meatus auditorius?

A. The meatus auditorius is the passage of the ear which leads to and terminates at the membrana tympani, or drum of the ear. It is near an inch long, and about the fourth part of an inch wide, and its passage is not strait but crooked, passing first upwards and then downwards, when it has a small tendency upwards again, and the lower part of its extremity bends a little down to the obliquity of the membrana tympani. The beginning of this passage is cartilaginous, being a continuation of the concha contracted, the end of it is bony, which makes the greatest part of the upper and back part of the meatus, as the cartilage does of the lower and fore part. The whole internal cavity of the meatus is lined with a membrane which seems to be a continuation of the skin that covers the auricula, and which grows thinner and thinner as it approaches the tympanum. In children, this bony canal is wanting, as well as the mastoid process.

Q. What is the cerumen?

A. The cerumen or wax of the ear is secreted from a number of little glands on the back side of the membrane whose excretory ducts bring it into the meatus. This wax by its bitterness and viscosity, together with the hairs in the membrane above-mentioned, hinders insects from approaching the membrana tympani, which

which it likewise preserves against the injuries of the air: When this wax is accumulated in too great quantity, it obstructs the meatus, by filling up the passage, and creates the most common kind of deafness; the remedy of which is picking the ears, or syringing them. Those great discharges of matter from the meatus auditorius, which are commonly called imposthumes in the ear, seem to be nothing else than ulcerations or great secretions from these glands.

Q. What is the membrana tympani?

A. The membrana tympani lies at the inner extremity of the meatus; it is extended upon a bony ridge or circle of the temporal bone. This is an oval membrane; thin, dry, firm, and transparent: though it seems stretched pretty tight, yet it is not plain, but concave outwardly toward the meatus, and inwardly convex; being pulled inward by the handle of the malleus, which is tied to it. This membrane does not entirely close the passage, but has on one side a small aperture covered with a valve, letting the smoke of tobacco taken in at the mouth find a passage through it out at the ears.

Q. What is the tympanum?

A. The tympanum, or drum of the ear, is a pretty large cavity, situated behind the membrana tympani; it is about the fourth part of an inch deep, as much wide, and about half as high. In very young children it is always found full of mucus, or a purulent matter, which seems necessary to prevent sounds from affecting

affecting them too much, there being no provision to shut the ears, as there is for the eyes. Cheselden gives an account of a gentleman who had four children born deaf, on which he was advised to lay blisters upon the heads of the next children he might have, which he did to three who were born afterwards, and every one of them heard well. It seems not unreasonable to suppose that too great a quantity of this mucus upon the drum might be the cause of deafness in the four children, and that the discharge made by the blisters in the latter case was the cause of their escaping the same misfortune. In this cavity are to be observed the periosteum, which lines it, a very thin membrane, and furnished with a great number of blood-vessels; and the chorda tympani being a little nerve composed of a combination of little branches of the fifth and seventh pairs, this is extended in the manner of a cord under the membrana tympani. In this cavity also there are four small bones already described in Dialogue the second, of which the first is the malleolus or hammer, so called because of its shape; its manubrium or handle, which is pretty long and small; it is fastened to the membrane of the tympanum, as hath been said, and its head is articulated by ginglymus with the body of the incus; which bone is articulated by arthrodia with the stapes, and the orbiculare lies between. The malleus is moved inward by the musculus obliquus internus, or trochliaris, or internus mallei; it extends the membrana tympani, that it may
be

be the more affected by impulse of sounds when they are too weak. This muscle arises from the cartilaginous part of the Eustachian tube, and passing from thence in a proper groove, it is reflected under a small process, and thence passes on perpendicular to the membrana tympani, to be inserted into the handle of the malleus: sometimes with a double tendon parallel to this muscle lies another extensor of the membrana tympani, called obliquus externus or externus mallei; but this is not so obviously an extensor as to be known to be so without an experiment. The muscle which relaxes the membrana tympani is called externus or laxator tympani. The relaxation of the membrane is made by this muscle, without our knowledge, when sounds are too strong; and as the pupil of the eye is contracted when we have too much light, and dilated when there is too little, from what cause soever, so when sounds are too low, or the sense of hearing imperfect, from whatever cause the extensors of the tympanum stretch it to make the impulse of sounds more effectual upon it, just as in the case of the common drum, and the cords of any musical instrument.

The principal cavities in the tympanum, are the opening of the mastoid cells: the opening of the Eustachian tube; the bony half canal; the fenestra ovalis; and fenestra rotunda; and to these may be added the small hole in the pyramid. The opening of the mastoid cells is at the posterior and upper part of the edge of the tympanum; the cells themselves which end there

there are hallowed out in the substance of the mastoid process, being very irregular and full of windings and turnings. The bony half canal lies immediately above the Eustachian tube, towards the upper side of the pars petrosa. In the recent subject, one of the muscles of the malleus is lodged in it. The hole in the apex of the pyramid is the orifice of a cavity, which may be named the sinus of this pyramid.

Q. What is the tubæ Eustachianæ?

A. The Eustachian tube or iter ad palatum, goes from the tympanum, (which cavity is called also the barrel of the ear); the beginning of this passage is very narrow and bony, the middle is cartilaginous, and its extremity, which opens into the back part of the nostrils, just above the uvula, is about the third part of an inch wide, membranous, and dilated by some muscular fibres; they dilate the extremity of this passage, either when we open our mouth to hear more distinctly, or when it is necessary there should be a free communication between the external air, and that in the cavity of the tympanum. This passage, therefore, seems to be exactly of the same use with the hole in the side of the common drum, that is, to let the air pass in and out from the barrel of the ear to make the membrane vibrate the better, and perhaps in the ear, which is closer than a common drum, to let air in or out as it alters in density, and if any fluid should be separated in the barrel of the ear, to give it a passage out. This passage being obstructed, as it is sometimes, by a large polypus behind the uvula, causes

causes great difficulty of hearing, and sometimes when the meatus auditorius is obstructed, a man opening his mouth wide, will hear pretty well through this passage, which is often so open, as that syringing water through the nose, it shall pass through into the barrel of the ear, and cause deafness for some time. To the stapes there is one muscle called musculus stapedius; it serves to pull the stapes from off the fenestra ovalis, which otherwise it covers.

Q. What is the foramina vestibulum and labyrinth of the ear?

A. The foramina vestibulum are three holes in the cavity of the tympanum leading to the cavity called vestibulum; which forms the middle part of the labyrinth, or innermost cavity of the ear, termed a labyrinth, from its sinuosities and windings. The first of these holes is called fenestra ovalis; to which, as hath been said, the base of the stapes is fixed, and completely stops it. It is a hole of communication between the tympanum and labyrinth. The next hole is the fenestra rotunda, it is situated above the fenestra ovalis, and the other leads into the cavity of the mastoide process. After these may be observed three semicircular canals, which open into the vestibulum by five orifices.

Q. What is the labyrinth?

A. The labyrinth is divided into three parts; the anterior, middle, and posterior. The middle portion is termed vestibulum, the anterior cochlea, and the posterior labyrinth in particular; which comprehends the three semicircular canals. The cochlea lies forward and inward
toward

toward the extremity of the pars petrosa; the semicircular canals backward and outward toward the basis of the process; and the vestibulum between the other two:

Q. What is the vestibulum?

A. It is an irregular round cavity, less than the tympanum, and situated more inward, and a little more forward. The two cavities are in a manner set back to back, with a common partition between them, perforated in the middle by the fenestra ovalis, by which the cavities communicate with each other. The cavity of the vestibulum is likewise perforated by several other holes; on the backside by the five orifices of the semicircular canals; on the lower part of the fore-side by a hole, which is one of the passages of the cochlea; and on the fore-side, toward the meatus auditorius opposite to the fenestra ovalis, by a number of very small holes, for the passage of the nerves; on the upper side there are only small pores.

Q. What are the semicircular canals?

A. The semicircular canals are only three in number, one vertical, one oblique, and one horizontal. The vertical canal is situated transversely with respect to the pars petrosa, the convex side of it being turned upward. The oblique canal lies further back than the former and runs parallel to the length of the process, the convex side being turned backward, with one extremity upward, the other downward; the superior extremity of this canal meets and loses itself in the external extremity of the former.

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The curvature and extremities of the horizontal canal are almost on a level; the curvature lying obliquely backward, and the extremities forward, and under those of the vertical canal, but a little nearer each other, the inner being almost in the middle space between the extremities of the oblique canal. The horizontal canal is generally the least of the three; the oblique is often, and the vertical sometimes, the greatest; and sometimes the two are equal. All the three canals are larger than a semicircle, forming nearly three fourths of one; they are broader at the orifices than at the middle. These orifices open into the backside of the vestibulum, and are but five in number, because two of them open into each other; so that in the posterior part of the vestibulum two appear toward the inside, and three toward the outside. In children, the substance of these canals is compact, while that which surrounds them is spongy. In adults all the parts of the bone are so solid, that these canals appear only like passages formed in a piece of ivory.

Q. What is the cochlea?

A. It is a sort of spiral body with two ducts, formed in the anterior part of the pars petrosa, somewhat resembling the shell of a snail. The parts to be distinguished in it, in its true situation, are, the basis, the apex, the spiral lamina, or half septum, by which its cavity is divided into two half canals; the modiolus, round which the cochlea turns; and lastly, the orifices and union of the two ducts. The basis is turned

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ed directly inward toward the internal foramen auditorium, the apex outward ; and the axis of the modiolus is nearly horizontal ; but in all of them allowance must be made for the obliquity of the pars petrosa in which they lie. The basis of the cochlea is gently hollowed, and toward the middle, perforated by several small holes. The modiolus is a kind of short cone with a very large basis, which is the middle of the basis of the cochlea ; through its whole length runs a double spiral groove, which thro' a microscope, shows a great number of pores. The cochlea makes about two turns and a half from the basis to the apex ; and the two half canals being firmly united together through their whole course, form a half septum, called lamina spiralis ; which must not be unfounded with the complete septum in the recent subject, as is often done. One edge of the lamina spiralis is strongly joined to the modiolus, being thicker there than in any other place ; whereas the other edge is terminated all round by a very thin border, lying in the middle cavity of the cochlea. In the natural state, the other half of the septum is membranous, and completes the partition between the two canals. The two half canals turn jointly about the modiolus ; one being situated toward the basis of the cochlea, the other toward the apex ; for which reason one of them may be called internal, the other external. The spiral or volute of the cochlea begins at the lower part of the vestibule, runs from thence forward to the top, then backward down to the bottom, afterwards upward and forwards ; and
soon

soon from the basis, which is turned inward, to the apex which is turned outward. The two half canals communicate fully at the apex of the cochlea.

A very delicate and fine membrane carried along through the cavities of the labyrinth, is formed of an expansion of the auditory nerve, and is the primary part of the organ of hearing, just as the retina is formed of the expansion of the optic nerve, and is the primary organ of seeing. Next may be observed the auditory canal, which is distinguished into the common and proper; the common is large, and has foraminula in it, passing into the labyrinth; the upper one is narrow and large, terminating partly in the cavity of the cranium, and partly between the styloide and mastoide processes.

Q. What are the blood vessels and nerves of the ear?

A. The arteries of the ear are from the carotids both external and internal; the veins run partly to the jugulars, and partly to the sinuses of the dura mater; the nervus auditorius enters by the hole in the internal process of the os petrosum. It consists of two bundles, of which one is hard, the other soft. Five branches of the portio mollis enter the vestibulum, and form a delicate web, which sends slips which run through the semicircular canals; the rest of the portio mollis enters the cochlea at the center of its base, and turns with the spiral line, of which it probably makes the membranous part. The portio dura passes through its pro-

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per passage, to be distributed among the external parts about the ear.

There have been instances of the tympanum being destroyed by an ulcer, and the auditory bones cast, without destroying the hearing. From which, and other like cases, it may be concluded that the membrana tympani, though useful in hearing, is not the seat of that sense, and if any disease in that membrane should obstruct the passage of sounds, to the internal parts of the ear, which are the seat of that sense, an artificial passage through that membrane might recover hearing, as the removing the crystalline humour, when that obstructs the light, recovers sight.

In all complaints of deafness, the practitioner ought carefully to examine the state of the ear, and learn whether the patient has or hath had any abscess in the external meatus of the ear affected, that might have eroded the membrane of the tympanum; and he should try whether it is sound or not. This is done by holding a lighted candle to the affected ear, and if upon a strong effort of expiration determined towards the ears, by stopping the mouth and nostrils, the flame of the candle is sensibly acted upon, we may conclude the membrane of the tympanum to be broken, and the hearing by that ear irrecoverably lost; for the cold air gets directly through the breach into the cavity of the tympanum, and by chilling and drying the delicate periosseum of the little bones, the membranes of the cavity, and the small muscles, renders the parts unfit for performing their functions.

functions. If the wax is hardened or even stony, drop in some oil of almonds over night, quickened with a very small proportion of chemical oil of aniseeds or amber; and the next morning inject with soap suds, and a little tincture of myrrh or traumatic balsam, made milk-warm or somewhat warmer. Injections are to be pushed in gently, not to hurt the membrana tympani. If there is an abscess in the external meatus it ought to be healed as soon as possible, that the pus may not at length affect the tympanum.

F I N I S.

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EXPLANATION of the FIGURES in the following TABLES.

TABLE I.

- 1 **O**S Frontis
- 2 Sutura Coronalis
- 3 Os Verticis
- 4 Sutura Squamosa
- 5 Os Temporis
- 6 Processus Mammillaris
- 7 Os Mala
- 8 Ossa Nasi
- 9 Ossa Maxillaris superiora
- 10 Os Maxillæ inferioris
- 11 Vertebrae Colli
- 12 Vertebrae Lumborum
- 13 Os Sacrum
- 14 Sternum
- 15 Scapula
- 16 Costæ Veræ
- 17 Costæ Nothæ
- 18 Clavicula
- 19 Processus Coracoideus
- 20 Os Humeri
- 21 Ulna
- 22 Radius
- 23 Os Ilium
- 24 Crista Ossis Ilii
- 25 Ischium
- 26 Os Pubis
- 27 Foramen Magnum
- 28 Os Femoris
- 29 Trochanter Major
- 30 Trochanter Minor
- 31 Patella
- 32 Tibia
- 33 Fibula
- 34 Talus
- 35 Os Calcaneum
- 36 Ossa Tarsi

TABLE II.

T A B L E - II.

- 1 Os Parietalia
- 2 Sutura Sagittalis
- 3 Sutura Lambdoidalis
- 4 Os Occipitis
- 5 Sutura Squamosa
- 6 Maxilla Inferior
- 7 Vertebræ Colli
- 8 ——— Dorfi
- 9 ——— Lumborum
- 10 Os Sacrum
- 11 Os Coccygis
- + Costæ Veræ, No. 7
- * Costæ Nothæ, No. 5
- 12 Clavicula
- 13 Scapula
- 14 Spina Scapulæ
- 15 Acromion
- 16 Os Humeri
- 17 Ulna
- 18 Radius
- 19 Offa Carpi
- 20 Offa Metacarpi
- 21 Offa Digitorum
- 22 Ilium
- 23 Ischium
- 24 Os Femoris
- 25 Collum Offis Femoris
- 26 Trochanter Major
- 27 Trochanter Minor
- 28 Condylus exterior Offis Femoris
- 29 Condylus interior Offis Femoris
- 30 Tibia
- 31 Fibula
- 32 Os Calcaneum
- 33 Offæ Tarfi
- 34 Offæ Metatarsi

T A B L E III.

T A B L E III.

- 1 Frontales
- 2 Orbicularis Palpebræ
- 3 Zygomaticus Major
- 4 Nasales Labii superior
- 5 Depressor Labii inferior
- 6 Depressor anguli oris
- 7 Platysma myoidea
- 8 Pectoralis
- 9 Latissimus dorsi
- 10 Serratus magnus
- 11 Externus obliquus abdominis
- 12 Recti abdominis
- 13 Pyramidales
- 14 Linea alba
- 15 Gracilis
- 16 Adductor longus tricipitis femoris
- 17 Pectineus
- 18 Psoas magnus
- 19 Iliacus internus
- 20 Sartorius
- 21 Glutæus medius
- 22 Fascialis
- 23 Vastus externus
- 24 Rectus femoris
- 25 Vastus internus
- 26 Pars bicipitis
- 27 Pars gastrocnemii
- 28 Soleus
- 29 Peroneus longus
- 30 Extensor longus digitorum pedis
- 31 Tibialis anticus
- 32 Deltoidea
- 33 Triceps
- 34 Biceps
- 35 Brachiiæus externus
- 36 Supinator longus
- 37 Pronator rotundi radii
- 38 Radialis internus
- 39 Palmaris longus
- 40 Sublimis
- 41 Ulnaris internus
- 42 Abductor longus pollicis
- 43 Radialis externus longus

T A B L E IV.

T A B L E IV.

- 1 Temporalis
- 2 Mastoidæus
- 3 Trapezius
- 4 Deltoides
- 5 Brachiaæus
- 6 Gemellus
- 7 Palmaris longus
- 8 Sublimis
- 9 Ulnaris internus *
- 10 Radialis externus longior
- 11 Extensor communis digitorum
- 12 Infra spinatus
- 13 Latissimus dorsi
- 14 Obliquus externus abdominis
- 15 Glutæus medius
- 16 Glutæus major
- 17 Gracilis
- 18 Adductor magnus femoris
- 19 Semitendinosus
- 20 Biceps Cruris
- 21 Vastus externus
- 22 Gastrocnemius
- 23 Soleus
- 24 Tendo Achillis

T A B L E V.

T A B L E V.

- 1 Occipitalis
- 2 Attollens auriculam
- 3 Orbiculares palpebrarum
- 4 Latissimus colli
- 5 Mastoideus
- 6 Trapezius
- 7 Deltoides
- 8 Biceps
- 9 Brachialis internus
- 10 Triceps
- 11 Supinator longus
- 12 Radialis internus
- 13 Radialis externus longior
- 14 Radialis externus brevis
- 15 Ulnaris externus
- 16 Abductor pollicis longus manus
- 17 Infraspinatus
- 18 Teres minor
- 19 Teres major
- 20 Latissimus dorsi
- 21 Pectoralis
- 22 Serratus magnus
- 23 Obliquus externus abdominis
- 24 Tensor vaginæ femoris
- 25 Glutæus medius
- 26 Glutæus magnus
- 27 Semitendinosus
- 28 Biceps cruris
- 29 Vastus externus
- 30 Rectus Cruris
- 31 Gastrocnemius
- 32 Soleus
- 33 Tendo Achillis
- 34 Peroneus longus
- 35 Peroneus brevis
- 36 Extensor longus digitorum pedis
- 37 Tibialis anticus
- 38 Ligamentum a patella ad tibiam pertinens
- 39 Vastus Internus
- 40 Sartorius
- 42 Triceps pars quæ longus vocatur
- 43 Triceps pars quæ brachialis externus vocatur
- 44 Brachialis internus
- 45 Biceps brachii
- 46 Pronator teres
- 47 Palmaris longus
- 48 Sublimis
- 49 Ulnaris internus
- 50 Ulnaris externus

T A B L E VI. F I G. I.

- 1 The larynx
- 2 The internal jugular vein
- 3 The subclavian vein
- 4 The vena cava descendens
- 5 The right auricle of the heart
- 6 The right ventricle
- 7 Part of the left ventricle
- 8 The aorta ascendens
- 9 The arteria pulmonalis
- 10 The right lobe of the lungs, part of which is cut off to shew the great blood vessels
- 11 The left lobe of the lungs
- 12 The diaphragm
- 13 The liver
- 14 The ligamentum rotundum
- 15 The gall bladder
- 16 The stomach pressed by the liver toward the left side
- 17 The small guts
- 18 The spleen

F I G U R E II.

- 1 The right ventricle of a fœtus distended with wax
- 2 The right auricle
- 3 The left auricle
- 4 Branches of the pulmonary veins of the right lobe of the lung
- 5 The arteries of the left lobe of the lungs
- 6 The vena cava descendens
- 7 The aorta ascendens
- 8 The arteria pulmonalis
- 9 The ductus arteriosus

T A B L E VII.

T A B L E VII. FIGURE I.

- A. The upper orifice of the Stomach
- B. The stomach
- C. The pylorus
- D. D. Arteries
- E. F. Nerves which accompany the arteries
- G. The duodenum
- H. H. I. I. I. The small guts
- K. The valve in the colon
- L. The appendicle of the cæcum
- M. N. The colon
- O. The rectum
- P. The constrictor of the anus
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- B. A kidney in its natural state
- C. The vena cava
- D. The aorta
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- F. F. The emulgent vessels
- G. G. The ureters
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- I. The neck of the bladder
- K. L. The testicles
- M. The process of the peritoneum (in which the spermatic vessels go)
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- Q. The Epididymis
- R. R. The vasa deferrentia
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- T. T. The two bodies which compose the penis, and appear when the
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- U. U. The prepuce
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- B. The pancreatic duct with its branches C. C. C. C. C. C.
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- 3 Ligamentum arteriosum
- 4 Arteriae subclaviae
- 5 ——— carotides
- 6 ——— vertebrales
- 7 ——— temporales
- 8 ——— occipitales
- 9 Contorsiones carotides
- C. Glandula pituitaria
- D. Arteriae ophthalmicae
- 10 Contorsiones vertebrales
- 11 Ramificationes arteriae
- 12 Arteriae mammariae
- 13 ——— cubitales
- 14 Arteria aorta descendens
- 15 ——— bronchialis
- 16 Arteriae intercostales
- 17 Arteria coeliaca
- 18 Arteriae hepaticae
- 19 Arteria cystica
- 20 ——— coronaria inferiora stomachi
- 21 ——— pylorica
- 22 ——— epiploica
- 23 ——— coronaria superiora stomachi
- 24 Arteriae phrenicae
- 25 Arteria splenica
- 26 ——— mesenterica superior
- 27 ——— inferior
- 28 Arteriae emulgentes
- 29 ——— vertebrales lumborum
- 30 ——— spermaticae
- 31 Arteria sacra
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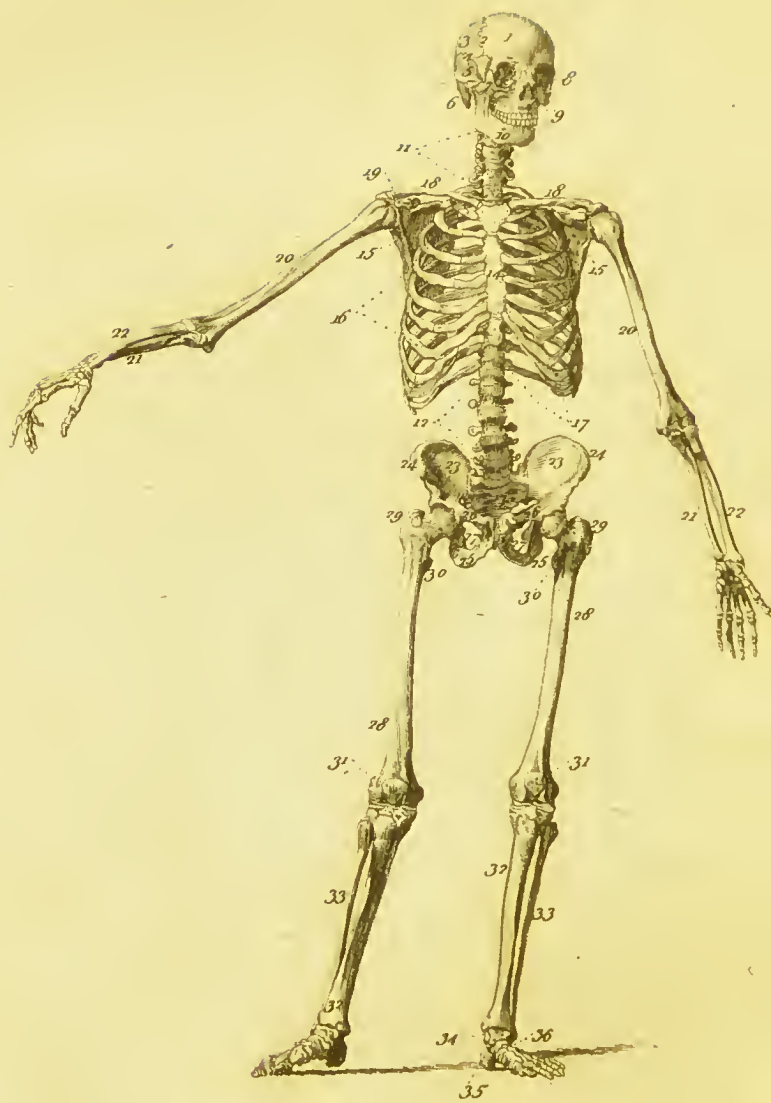
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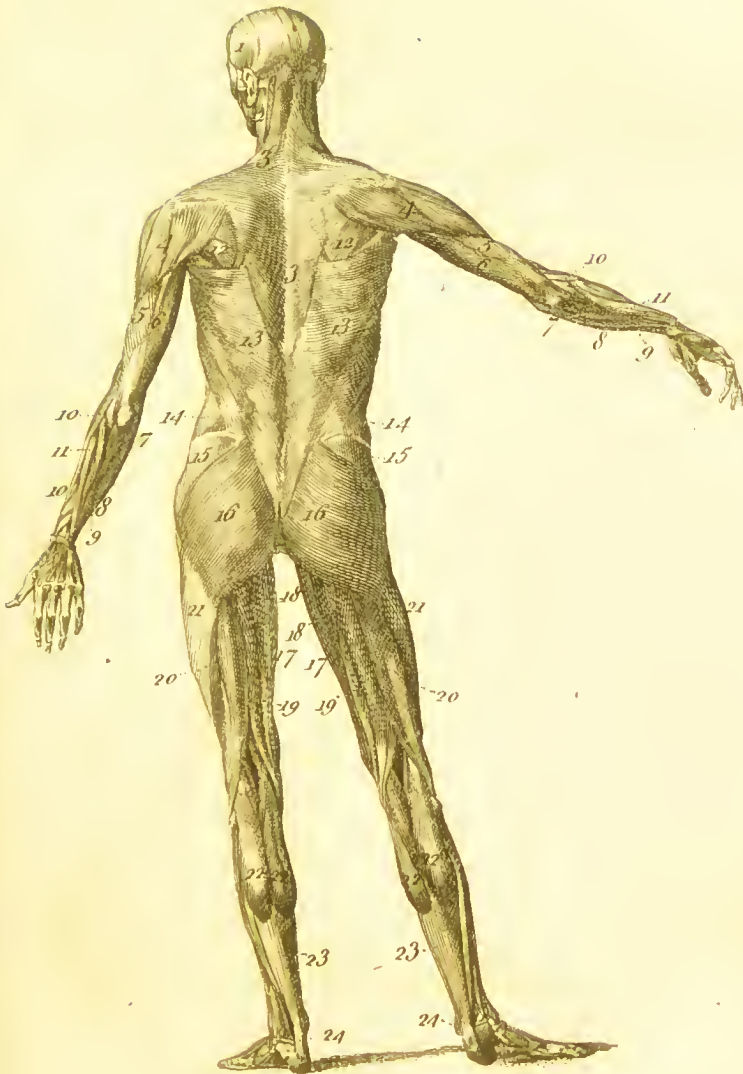


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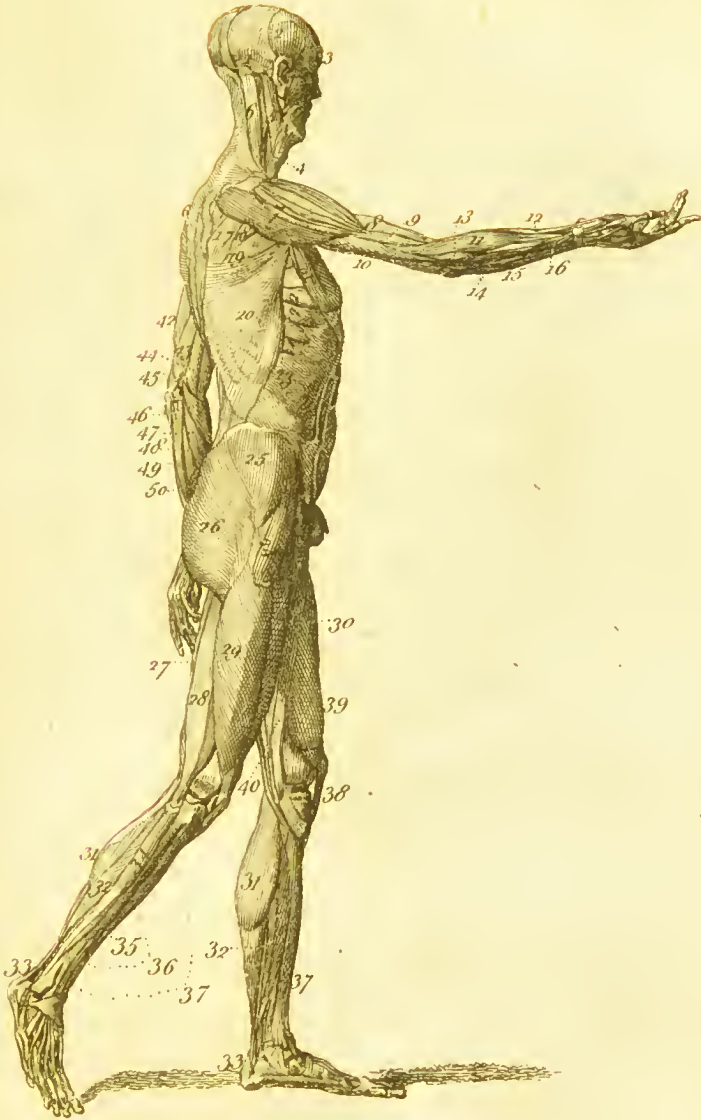




TAB. IV.



TAB. V.





TAB. VI.

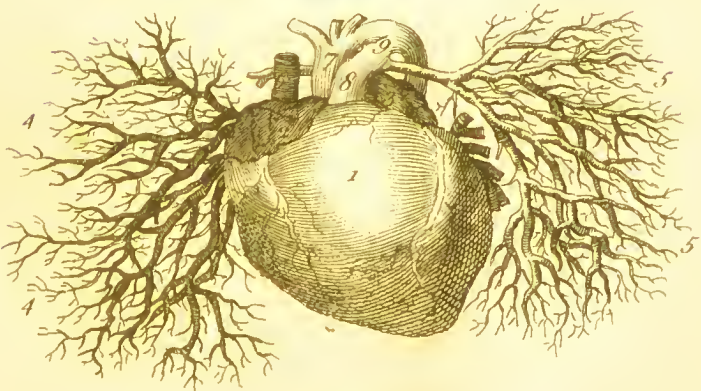
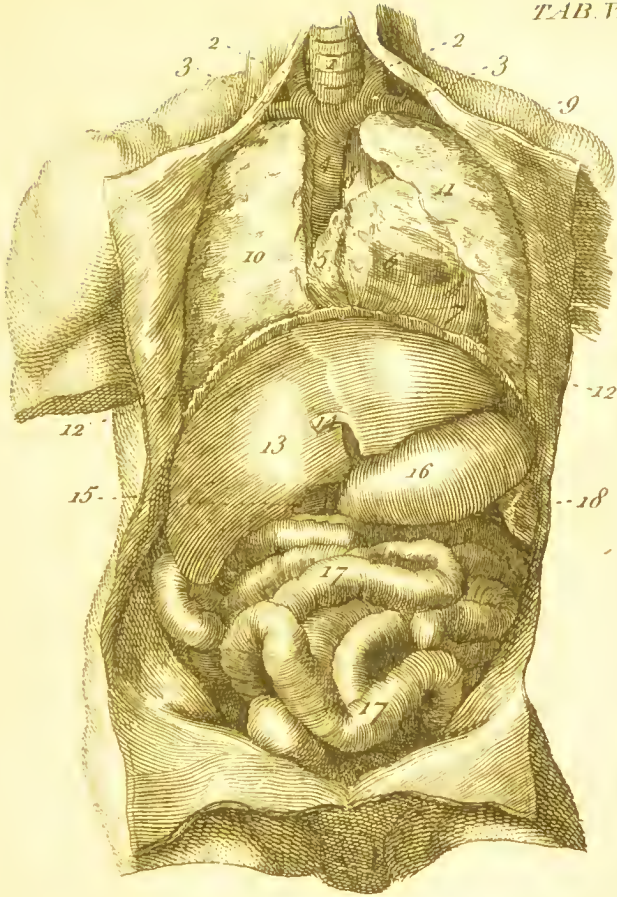




Fig. 1.

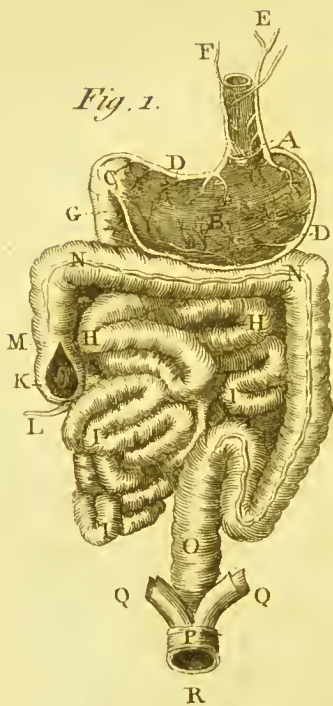


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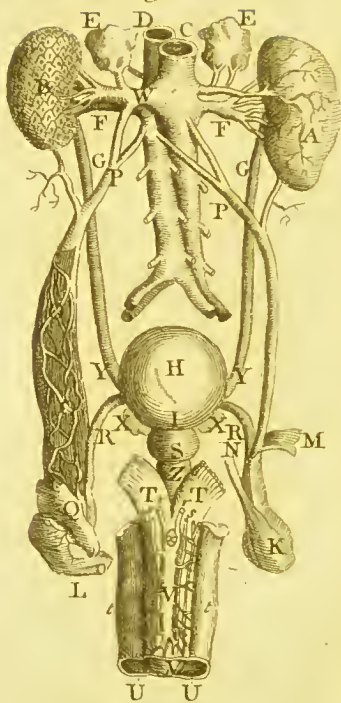
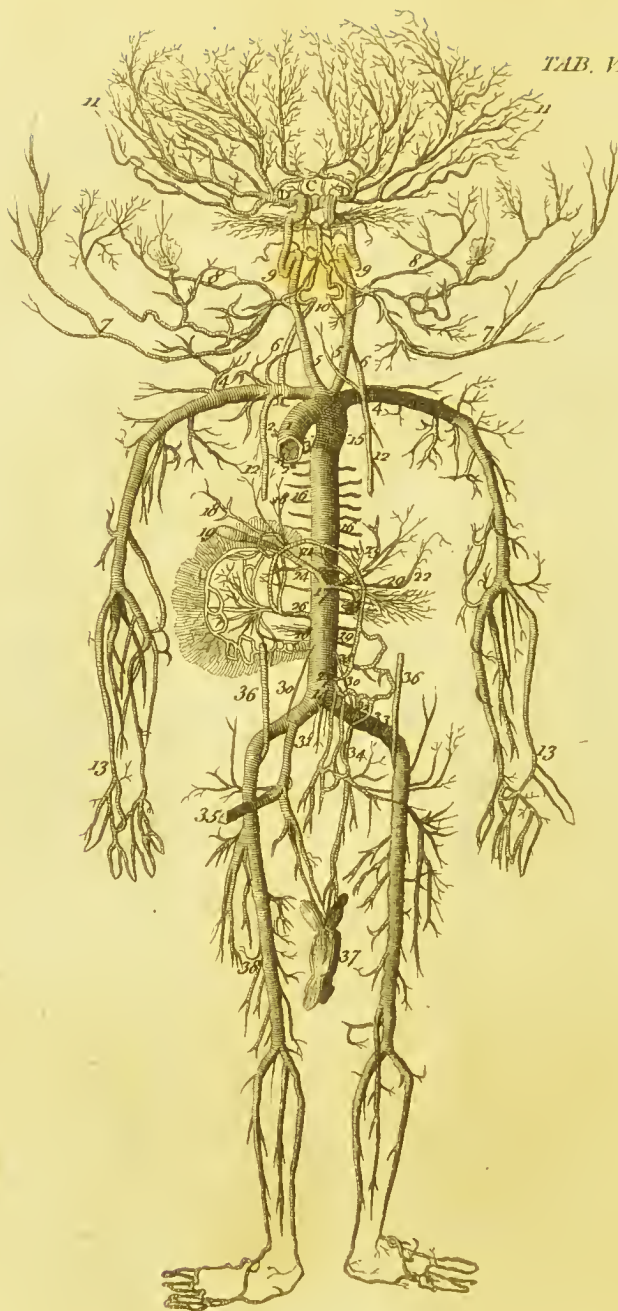
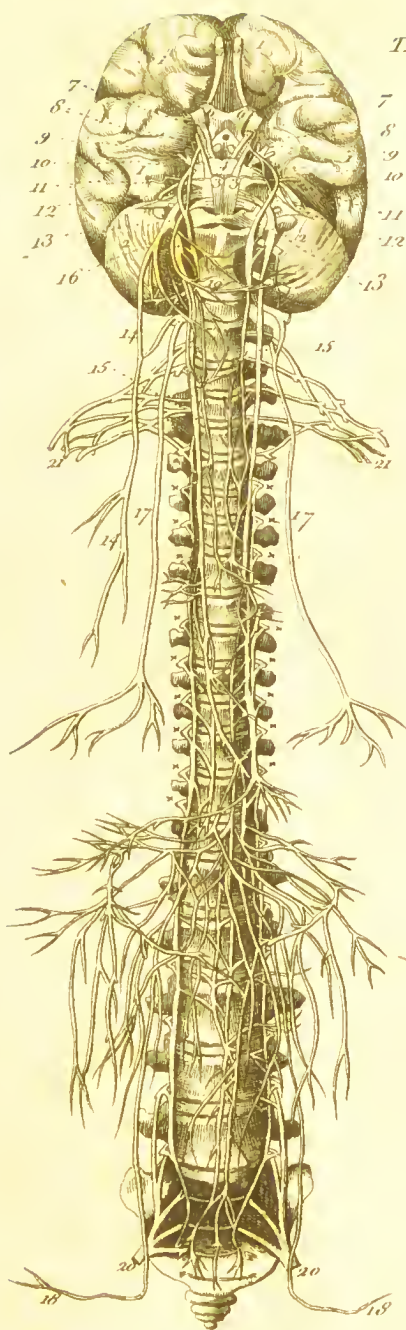


Fig. 3.





TAB. IX.



TAB. X.





